

EMS CASE STUDIES IN THE PUBLIC WATER SECTOR

*Environmental Management Systems: Assisting Wastewater
And Drinking Water Facilities Achieve Environmental Excellence*



- Case Study #1: Kent County, DE Wastewater Treatment Facility
- Case Study #2: Natick, MA Springvale Water Treatment Plant
- Case Study #3: Camden County, NJ Municipal Utilities Authority
- Case Study #4: Oakland County, MI Drain Commissioner's Office
- Case Study #5: Lowell, MA Regional Wastewater Utility

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The following individuals participated in the design and development of this Case Study Compendium:

| Name | Organization |
|--|---|
| Jim Horne <i>National Program Manager</i> | U.S. EPA Office of Water |
| Bob Bois <i>Environmental Compliance Officer</i> | Natick, MA Springvale Water Treatment Plant |
| Sherri Gee <i>ISO Coordinator</i> | Oakland County, MI Drain Commissioner's Office |
| Andy Kricun <i>Deputy Executive Director</i> | Camden County, NJ Municipal Utilities Authority |
| Jim Newton <i>Environmental Program Manager</i> | Kent County, DE Wastewater Treatment Facility |
| Mark Young <i>Executive Director</i> | Lowell, MA Regional Wastewater Utility |
| Global Environment & Technology Foundation | |
| Faith Leavitt <i>Principal</i> | Nick Martin <i>Program Manager</i> |
| Noeleen Tillman <i>Vice President</i> | Brian Matthay <i>Project Manager</i> |
| Scott Christian <i>Intern</i> | |

For more information about the U.S. EPA supported PEER Center programs, please visit www.peercenter.net and/or contact:

Jim Horne
National Program Manager
U.S. EPA - Headquarters
(202) 564-0571
horne.james@epa.gov

Nick Martin
Program Manager
Global Environment & Technology Foundation
(703) 379-2713
nmartin@getf.org



TABLE OF CONTENTS

| | |
|--|-----------|
| EXECUTIVE SUMMARIES..... | 5 |
| <i>KENT COUNTY DEPARTMENT OF PUBLIC WORKS.....</i> | <i>5</i> |
| <i>NATICK, MASSACHUSETTS.....</i> | <i>7</i> |
| <i>CAMDEN COUNTY MUNICIPAL UTILITIES AUTHORITY.....</i> | <i>9</i> |
| <i>OAKLAND COUNTY DRAIN COMMISSIONER'S OFFICE.....</i> | <i>11</i> |
| <i>CITY OF LOWELL, MASSACHUSETTS.....</i> | <i>13</i> |
| CASE STUDY #1: KENT COUNTY DEPARTMENT OF PUBLIC WORKS..... | 15 |
| CASE STUDY #2: NATICK DEPARTMENT OF PUBLIC WORKS..... | 29 |
| CASE STUDY #3: CAMDEN COUNTY MUNICIPAL UTILITIES AUTHORITY..... | 41 |
| CASE STUDY #4: OAKLAND COUNTY DRAIN COMMISSIONER'S OFFICE..... | 49 |
| CASE STUDY #5: THE CITY OF LOWELL, MASSACHUSETTS..... | 60 |
| ADDITIONAL EMS INFORMATION AND RESOURCES..... | 70 |

INTRODUCTION

Water and wastewater utilities are facing unprecedented challenges in the years ahead. Increasing demands from customers, regulatory agencies, and others in the community make it more important than ever before for these utilities to use state-of-the-art management approaches like environmental management systems (EMS).

EMSs provide a structured approach for the utility to manage a full range of activities in order to improve environmental performance. EMSs also help utilities identify more efficient ways to operate and reduce unnecessary risks and costs. Finally, using an EMS can help utility managers operate with more confidence and build better relations with the communities they serve and regulatory agencies.

The following case studies are designed to help utilities understand how their colleagues have used EMSs to achieve important results. They were developed, in large part, by your colleagues in the industry and will hopefully illustrate how an EMS can help your utility operate more effectively.

An additional list of EMS resources that can help you is also provided at the end of this compendium.

EXECUTIVE SUMMARY #1

KENT COUNTY DEPARTMENT OF PUBLIC WORKS Wastewater Treatment Facility

The Kent County Department of Public Works (DPW) Wastewater Treatment Facility (KCWTF) implemented their EMS, beginning in January 2003, through simultaneous participation in two national EMS pilot projects: 1) the U.S. EPA supported Third EMS Initiative for Government Entities (www.peercenter.net); and 2) the National Biosolids Partnership (NBP) EMS Program (www.biosolids.org). The two programs offered Kent County the opportunity to integrate the wastewater facility's EMS efforts with their on-site private sector biosolids management partner K-F Environmental Technologies, Inc and leverage the technical assistance and national recognition offered through both programs.

EMS Fenceline

- Regional wastewater collection and treatment system, including maintenance and engineering support functions and private partner biosolids operations.
- 16 MGD wastewater treatment facility with land application of a Class A biosolids.
- 59 pump and lift stations and over 45 miles of force main and main sewer lines.
- 39 staff with an additional 14 engineering staff with some responsibilities related to wastewater operations.
- Operations serve 70% of the county's population.

Key Reasons for Implementing an EMS

- More efficient use of time, monetary, and natural resources.
- Model for industries within the community.
- Ability to respond to and implement new regulatory initiatives.
- Commitment to developing a positive environmental image for the County.

Current EMS Objectives and Targets

Kent County has established Environmental Management Programs to achieve their robust quantitative EMS Objectives and Targets, which currently include:

- Reduce sulfur dioxide, particulate and CO emissions by 50% from CY 2002 levels.
- Reduce electricity usage by 20% from CY 2002 levels.
- Improve safety of existing processes or switch to alternative disinfection methods.
- Reduce Sanitary Sewer Overflows by 40% from CY 2002 levels.

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|  Top 3 Keys to Success | 1. Active senior management support. |
| | 2. Committed Core Team that understood the program and desired to see it completed. |
| | 3. Participating in national EMS initiatives allowed Kent County to learn from prior participants, leveraging existing knowledge and expertise. |

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|  <p>Top 3 Barriers</p> | 1. It is important not to take too long to “roll out” the program and implement the EMS. Early momentum is key. |
| | 2. It proved more difficult than originally expected to facilitate the private-public partnership and to keep all team members on the same page and committed. |
| | 3. Many organizational layers, internal and external, have to agree to participate in the program. |
|  <p>Top 3 Lessons Learned</p> | 1. It's important to undertake the project using the assistance of practitioners and experienced technical assistance providers. |
| | 2. Active senior management involvement throughout the project, even before implementation actually begins. |
| | 3. Interaction with team members on an almost daily basis, especially during the first stages of EMS implementation. |

Resource Commitment

- 8 members on the EMS Core Team.
- 25% of time dedicated by a single Environmental Management Representative (“EMR”) to serve as overall program manager or team leader for the EMS implementation.
- Bi-weekly, one hour Core Team meetings (8 team members) during the EMS development phase and quarterly meetings during the ongoing maintenance phase of the EMS.
- One complete EMS cycle (24 months) required 2,985 total person hours at a total cost of approximately \$101,691 in direct labor resources, and about \$40,000 in other costs including national program participation (including technical assistance), travel to workshops, and third-party certification audits.

Return on Investment – EMS Benefits

- Potential energy savings of \$200,000-300,000 per year, as a result of serious consideration of installing a renewable wind energy system, an on-site bio-gas station, and/or a generator load sharing agreement.
- Effective employee succession program to contain knowledge.
- Potential reduced air pollution by 5 million pounds of carbon dioxide per year, 20% hydrocarbon emissions, 12% carbon monoxide emissions, and 12% in particulate emissions, as a result of switching to B20 biodiesel as a fuel source.
- Improved chlorine delivery system.
- 85% reduction in Sanitary Sewer Overflows.
- Improved public image and award recognition
 - 2004 NACo Achievement Award
 - 2004 Clean Water Act Pretreatment Program runner-up
 - Environmental Protection Magazine Facility of the Year

EXECUTIVE SUMMARY #2

NATICK, MASSACHUSETTS ***Springvale Water Treatment Plant***

The Natick Department of Public Works (DPW) Springvale Water Treatment Plant implemented their EMS beginning in February 2002, through funding provided by the Massachusetts Department of Environmental Protection (DEP) Municipal Stewardship Grants program. Grants were awarded to nine municipalities and two regional organizations for projects that would promote sustainable environmental stewardship through the use of an EMS or an environmental management plan that demonstrated enhanced performance through performance measurement. Technical assistance was provided by the state DEP and the consulting firm of Woodard & Curran. The decision to implement an EMS was also in response to a November 2001 U.S. EPA Consent Agreement requiring Natick to complete a Supplemental Environmental Project.

EMS Fenceline

- Springvale Water Treatment Facilities: Treatment Plant, Pumping Facilities, Production Wells, Distribution System, and Sanitary Sewer Pumping Facilities.
- Three satellite water supply wells, two water storage tanks, 36 sewer stations, one water booster pump station, and all mechanical parts for the water distribution system.
- 26 employees operate and maintain the town's water treatment plant, water wells, and sewer pump stations on a 24-hour basis.
- Operations serve the town's population of approximately 32,000.

Key Reasons for Implementing an EMS

- Serve as a model for municipalities within the region.
- Largest chemical user in town with location near highly populated areas.
- Ability to efficiently respond to new regulatory initiatives by state DEP and Federal EPA.
- Improve image and establish a working relationship with regulators.
- Commitment to developing a positive environmental image for the Town.

Current Environmental Targets

Natick has established the following environmental targets to measure progress in meeting the Sewer and Water Division's EMS objectives for 2005:

- No spills or releases of chemicals above regulatory reporting concentrations.
- No more than five liquid/solid chemical spills or releases per year.
- Eliminate confined space in waste water pump stations by FY 2007.
- Train emergency response team to protect storm water drainage in Zone II of town drinking water wells by December 2005.
- Eliminate the use of chlorine gas as a treatment chemical at the treatment plant by December 2005.
- Maintain noise in the office space at less than 70 db by December 2005.

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|  <p>Top 3 Keys to Success</p> | <ol style="list-style-type: none"> 1. External program participation and outside technical assistance. 2. Proven templates and the ability to leverage practitioner tools. 3. Technical assistance consultant with EMS experience and water systems knowledge. |
|  <p>Top 3 Barriers</p> | <ol style="list-style-type: none"> 1. Finding consistent meeting times was difficult, especially with 24/7 operations. 2. Personnel other than the EMS Program Manager had very limited upfront knowledge of the EMS process. 3. Development of environmental management plans could have been more effective early on. |
|  <p>Top 3 Lessons Learned</p> | <ol style="list-style-type: none"> 1. EMS is about continual improvement - be realistic about what it can reasonably achieve with each cycle. 2. You cannot implement an EMS completely from scratch without outside examples and experiences. 3. Translate EMS jargon to your organizational culture. |

Resource Commitment

- Nine members on the EMS Core Team, with Strategic Oversight Committee serving an advisory role.
- 20% of time dedicated by single Environmental Management Representative (“EMR”) to serve as overall EMS program manager or team leader.
- One complete EMS cycle (Policy through Internal Audit) required approximately 1,000 total person hours at a total cost of approximately \$30,000 in labor resources and \$20,000 in consultant services.

Return on Investment – EMS Benefits

- Cost savings
 - Approximately \$40,000 avoided because a documented EMS standard operating procedure alleviated the need for back-up equipment (regulatory requirement).
 - Increased efficiency and operational consistency has resulted in a variety of cost and waste reductions (disposal cost decreases, recycled paper as a commodity, mixed compost).
- Improved ability to meet compliance requirements.
- Improved environmental awareness, involvement, and competency of staff throughout the Division.
- Improved internal and external communication of environmental issues.
- Recognition for leadership as an environmental steward.

EXECUTIVE SUMMARY #3

CAMDEN COUNTY MUNICIPAL UTILITIES AUTHORITY

Delaware No. 1 Water Pollution Control Facility - Camden, New Jersey

The Camden County Municipal Utilities Authority (CCMUA) Delaware No. 1 Water Pollution Control Facility implemented their EMS beginning in February 2000. EMS implementation was an internal decision that the Authority should utilize a systematic approach to managing their environmental, business, and community responsibilities efficiently and effectively. Technical assistance was provided by the consulting firm of Camp Dresser & McKee Inc.

EMS Fenceline

- Delaware No. 1 Water Pollution Control Facility in Camden, New Jersey.
- New Jersey's 4th largest wastewater treatment plant with a design capacity of 80 MGD and a hydraulic Capacity of 160 MGD.
- 145 employees operate and maintain the treatment plant, sewer collection system, and administration.

Key Reasons for Implementing an EMS

- Optimize performance of the treatment plant through systematic, ongoing identification of improvement opportunities.
- Better equip CCMUA staff to perform their jobs with defined roles, responsibilities, training, and procedures.
- Effectively respond to privatization pressures through internal efficiencies.
- Enhance public image, especially with regards to odor complaints.
- EMS provided a systematic, proven approach – stamp of authenticity.

Current Environmental Targets

Camden County established the following environmental targets to measure progress in meeting EMS objectives for 2005:

- Maintain suspended solids and Biological Oxygen Demand (BOD) below 20 ppm, with a target of below 15 ppm.
- Complete elimination (100%) of offsite odors.
- Maximal capture of wet weather flow, without adversely impacting water quality.

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|  Top 3 Keys to Success | 1. Must have defined plans with accountability (i.e., who, what, by when). |
| | 2. Routine follow-up to make sure plans are being implemented. |
| | 3. Demonstrate a continued commitment to positive progress and ensure that all team members understand expectations. |
|  Top 3 Barriers | 1. EMS was a relatively new and innovative approach, thus had to be sold throughout the organization. |
| | 2. Feeling that public sector organizations are limited and that there are no “carrots” for employee motivation and buy-in. |
| | 3. Achieving a comfort level with the program whereby employees would feel their ideas are listened to. |

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|  <p>Top 3 Lessons Learned</p> | 1. Stay persistent and hold teams and/or team members accountable for defined responsibilities and action plans. |
| | 2. Not the same drivers as in the private sector, thus need to adapt business case and consider rate payers. |
| | 3. Don't overlook the wealth of knowledge and experience internally within your organization. |

Resource Commitment

- 70% of time dedicated by single Environmental Management Representative.
- 7 members on the EMS Steering Committee.
- EMS Steering Committee, made up of select managers and employees, met weekly during initial stages and transitioned into a quarterly or as needed meeting schedule.
- CCMUA has institutionalized their EMS to the point that EMS goals are the same as overall organizational goals. Therefore, direct labor costs spent on EMS are the same as daily direct operational costs and can no longer be differentiated.

Return on Investment – EMS Benefits

CCMUA achieved the following “low hanging” fruit by 2000, shortly after implementing their EMS:

- Regularly discharging effluent that ranged from 12-18ppm, having struggled in the late 1990's to meet 30 ppm limits on a consistent basis.
- 25% reduction in operations and maintenance costs from \$21.2 million in 1996 to \$16 million in 2000, resulting in a 6% lower rate than in 1996.
- 20% increase in tonnage of sludge removed from the plant from 46,000 tons in 1999 to 55,000 tons in 2000.
- 90% reduction in verified odor complaints from 16 in 1997-1998 to 2 in last 6 years.
- Implementation of New Jersey Department of Environmental Protection (NJDEP) approved community notification system that provides the neighboring community with 24-hour telephone access for reporting odor concerns. The hotline provides real time community input to CCMUA's EMS.
- Provided a vehicle for communication with Board, whereby monthly reports and updates became expected and valued.

Since 2000, CCMUA has continued to experience EMS benefits, including:

- Reduction of wet weather bypasses from 24 in 1999 to 2 over the last 6 years.
- Optimization of water quality through improvement to sludge thickening and dewatering, to primary and final sedimentation tanks, and operational accountabilities and goal setting.
- CCMUA now removes 60,000 tons of sludge per year, an increase of 25% since 1999.
- Reduced offsite odors by initiating a zero tolerance program.
- Cost savings by identifying inefficiencies, water reuse, and energy efficiencies. CCMUA has held its rate for 10 straight years, with three rate cuts during this period.

EXECUTIVE SUMMARY #4

OAKLAND COUNTY DRAIN COMMISSIONER'S OFFICE **Wastewater Treatment Complex – Waterford, Michigan**

The Oakland County Drain Commissioner's Office (OCDC) in Waterford, Michigan implemented its EMS, beginning in January 2003, through participation in the U.S. EPA supported Third EMS Initiative for Government Entities (www.peercenter.net). The Drain Commissioner's Office previously developed an ISO 9001 registered Quality Management System and in April 2005 received ISO 14001 registration. The adoption of complementary ISO principles allowed the OCDC further measurement tools to ensure the high quality standards that county residents have come to expect.

EMS Fenceline

- Two Divisions: Engineering & Construction and Operation & Maintenance.
- Approximately 260 staff members.
- Twenty units, including Project Management, Regulatory Review, Environmental Stewardship, Operations and Maintenance service for Storm Drains, Sewers, Water Supply, Wastewater Treatment, and Administration.
- Commerce Wastewater Treatment Plant, George W. Kuhn Retention Treatment Basin, Pump Maintenance Facility, Walled Lake/Novi Wastewater Treatment Plant and Water Maintenance Facility.

Key Reasons for Implementing an EMS

- Improve employee awareness of environmental issues.
- Develop a working relationship with federal and state agencies.
- Positive impact on helping customers.
- Commitment to developing a positive environmental image for the county.

Current EMS Objectives and Targets

Oakland County has established Environmental Management Programs to achieve its robust quantitative EMS Objectives and Targets, which currently include:

- Reduce high dosage chlorine flushed into waters from OCDC operation and maintenance activities by developing new standards by June 2005 and by revising OCDC chlorination procedures for disinfection.
- Reduce the amount of paper used and increase the percentage of cardboard and batteries recycled by 50% within two years.
- Reduce potential for unnecessary inflow and infiltration in the Clinton/Oakland interceptor system by repairing all sub-standard manholes by December 2005.
- Reduce potential for sewer system overflows and unnecessary inflow and infiltration in the Evergreen-Farmington Sewage Disposal System by rehabilitating all sub-standard floodprone manholes by December 2005.

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|  <p>Top 3 Keys to Success</p> | <ol style="list-style-type: none"> 1. Taking the time to visit each of the facilities, meet with management and employees, and discuss the initial goals and objectives. This was effective in showing support and keeping everyone updated. 2. Effective communication. It is worth the time and effort to keep everyone on the same page with consistent understanding and involvement from all levels of employees. 3. Top management involvement in setting goals and defining environmental management programs. |
|  <p>Top 3 Barriers</p> | <ol style="list-style-type: none"> 1. Selling the benefits of environmental responsibility to municipal customers. 2. Initial confusion associated with integrating management systems and initiatives. Many employees viewed early efforts as three separate initiatives (ISO 9001, ISO 14001, and EMS). 3. Managing resources was difficult as many employees face “competing” responsibilities on top of ISO implementation. |
|  <p>Top 3 Lessons Learned</p> | <ol style="list-style-type: none"> 1. Communicate early and often across all lines of the organization. Avoid early confusion. 2. Translate EMS terms into organization terms as much as possible, especially in the beginning. 3. Keep all players involved from goal setting to ensure uniformity. |

Resource Commitment

- Five members on the EMS Core Team.
- 477 hours dedicated by a single Environmental Management Representative (“EMR”), over a two-year period, to serve as overall program manager or team leader for the EMS implementation.
- Semi-monthly Steering Committee meetings (top management and EMS Core Team) were held during implementation, and monthly meetings continue.
- One complete EMS cycle (24 months) required 2,646 total person hours at a total cost of approximately \$130,559 in direct labor resources.

Return on Investment – EMS Benefits

- Retention of “institutional experience” which previously left with the retirement or transfer of key veteran employees.
- Employee ownership of managing environmental impacts, resulting in ideas and suggestions for improvement.
- ISO 14001 Third-party Registration.
- Benefit of having an integrated Quality and Environmental system
 - Cost savings
 - Utilize and build on existing systems
 - Avoids confusion

EXECUTIVE SUMMARY #5

CITY OF LOWELL, MASSACHUSETTS Regional Wastewater Utility

The Lowell, MA Regional Wastewater Utility implemented their EMS beginning in August 1997 through participation in the U.S. EPA supported First EMS Initiative for Local Governments (www.peercenter.net). The Utility proceeded to achieve ISO 14001 certification for all divisions in August 2000 becoming the first wastewater utility in the nation to achieve this distinction.

EMS Fenceline

- Lowell Wastewater Utility – an activated sludge facility with a design flow of 32 million gallons a day (MGD).
- Provides primary and secondary treatment to more than 180,000 users in five communities.
- The system includes 230 miles of sewer lines, 5,000 catch basins, 5,000 manholes, and 46 employees.

Key Reasons for Implementing an EMS

- Enhance the City's overall image;
- Improve environmental performance;
- Help lead the region's public sector toward compliance with the ISO standards through education, training, and awareness;
- Maximize efficiency, reduce costs, and avoid costly environmental emergencies thereby saving taxpayers money; and
- Compete with, and be better than, the private sector.

Current EMS Objectives and Targets

Lowell has established Environmental Management Programs to achieve their robust quantitative EMS Objectives and Targets, which currently include:

- Reduce impact on wastestream
 - Increase waste recycled by 5% by 12/31/05
 - Maintain program aimed at increasing public awareness in 2005
 - Eliminate sludge disposal to landfill
- Energy Conservation
 - Continue to reduce Kw usage by 12/31/05
- Improve chemical management
 - Achieve zero spills in 2005
 - Continue to quantify state regulated waste disposed by end of 2005
- Odor reduction
- Not to exceed previous year's odor complaints
- Improve industrial effluent
- Establish inter-departmental new business awareness program

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|  <p>Top 3 Keys to Success</p> | <ol style="list-style-type: none"> 1. Hard working and dedicated staff. 2. Supportive upper management, including City Manager, City Council, and other elected officials. 3. Hiring an external consultant to assist with document control and the development of the EMS manual. |
|  <p>Top 3 Barriers</p> | <ol style="list-style-type: none"> 1. Time and resource allocation – educating employees about the ISO concept and conducting implementation activities can be time consuming. 2. Lack of active support and buy-in from the community. 3. Staff turnover, including the loss of key Core Team members. |
|  <p>Top 3 Lessons Learned</p> | <ol style="list-style-type: none"> 1. Hire an external consultant to support early implementation and training efforts. 2. Add an additional facility within the original EMS fenceline to eliminate duplicating efforts down the line. 3. Development of metrics proved to be one of the most difficult EMS elements, as this practice was still relatively new in the municipal sector. |

Resource Commitment

- 14 members on the original EMS Implementation Core Team, including the Executive Director, with 7 members currently on the EMS Team.
- 10% of time dedicated by a single Environmental Management Representative (“EMR”) to serve as overall program manager or team leader for the EMS implementation.
- Bi-weekly Core Team meetings (14 team members) during the EMS development phase and less frequent, focused meetings during the ongoing maintenance phase of the EMS.
- One complete EMS cycle (24 months) required 1,424 total person hours at a total cost of approximately \$27,100 in direct labor resources, \$10,500 in consultant costs, and about \$4,800 in other travel and material costs.

Return on Investment – EMS Benefits

- Lowell became the first municipal facility in the U.S. to certify all of its divisions to the ISO 14001 Standard.
- In the first three years, Lowell realized several direct cost savings of over \$180,000 (some annual savings) through recycling and energy reductions.
- In 2004, Lowell accomplished the following results:
 - 46,893 total lbs of materials recycled
 - 110 total gallons utility used oil recycled
 - 140 total gallons citizen oil recycled
 - 1,520 total linear feet of fluorescent bulbs recycled
 - No reportable chemical spills
 - Odor complaints reduced by 50% from 2003 levels

EMS CASE STUDY #1

KENT COUNTY DEPARTMENT OF PUBLIC WORKS

Wastewater Treatment Facility

Organizational Profile/Background

Kent County is in the middle of Delaware's three counties. It is the smallest of the three having a population of approximately 134,000. The major city in the county, Dover (which is the second largest city in Delaware), also serves as the state capital. Kent County is bounded to the north by New Castle County, to the south by Sussex County, to the west by Maryland, and to the east by the Delaware River and Delaware Bay. The county is a mix of industry, regional commercial banking and retail, farming, and numerous bedroom communities for nearby Wilmington, DE and Philadelphia, PA. Major activity areas within the county include a state park, Dover Air Force Base, Dover Downs, the Delaware State Fairgrounds complex, and several significant industries who discharge into the county wastewater system.

Kent County is a commissioner-based, county manager operated government. It consists of three major departments and several smaller departments. The major departments are Public Safety, Planning, Parks and Recreation and Public Works. The County has over 250 employees within these three and several smaller departments. Included within the Public Works Department is a 16 MGD wastewater treatment plant that treats most of the wastewater in the county, over fifty pump stations and nearly 50 miles of gravity sewer and force main, and management of County owned buildings. The wastewater that enters the Kent County regional system comes from five municipal contract users and ten significant industrial users. The City of Harrington operates a separate advanced wastewater treatment facility.

An on-site private contractor, K-F Environmental Technologies, Inc., treats and facilitates land application of a Class A biosolids. Kent County and K-F currently treat the biosolids from the Harrington facility and will shortly be contracted to land apply the biosolids on County-owned property.

NATIONAL PILOT PROJECT PARTICIPATION

The Kent County Department of Public Works decided to implement their EMS through the 3rd *EMS Initiative for Public Entities*, a U.S. EPA supported national pilot project facilitated by the Global Environment & Technology Foundation (www.getf.org). During the initial stages of participation and EMS implementation, Kent County also decided to join the National Biosolids Partnership program which allowed the organization to follow the implementation plan of the EMS Initiative and include their biosolids partner operations.

Since August 1997, 32 public entities have benefited from environmental management system (EMS) implementation thanks to their participation in three "EMS Initiatives for Local Government Entities" initiatives. The initiatives were made possible through a cooperative agreement between the U.S. Environmental Protection Agency (EPA) and

the Global Environment & Technology Foundation (GETF). The initiatives tested the applicability and benefit of an EMS on environmental performance, pollution prevention, and stakeholder involvement in government operations. Participant organization's have included ports, universities, utilities, wastewater treatment, and others further promoting EPA's overall policy to actively promote adoption of EMSs in key sectors. For more information on these initiatives please visit www.getf.org/projects/muni.cfm.

The goal of the National Biosolids Partnership (NBP) EMS Demonstration Program, a not-for-profit alliance formed in 1997 between the Association of Metropolitan Sewerage Agencies (AMSA) and Water Environment Federation (WEF), with advisory from the U.S. Environmental Protection Agency (EPA), is to advance environmentally sound and accepted biosolids management practices. A central component of this effort is a national EMS pilot program involving over 100 participants throughout the nation. For more information see www.biosolids.org.

EMS FENCELINE SELECTED

Kent County selected the wastewater treatment facility and collection system as their initial EMS fenceline. The Department of Public Works maintains and operates the regional wastewater collection and treatment system, building maintenance and engineering functions to support both. The regional system serves 70% of the Kent County population through a 16 MGD wastewater treatment plant, collection system consisting of fifty-nine pump and lift stations, and over forty-five miles of force main and main sewer lines.

This select area of operations currently employs thirty-nine staff with an additional fourteen engineering staff that have some responsibilities related to wastewater operations. This selection offers a unique opportunity to promote a public/private partnership, since the biosolids portion of the wastewater facility is owned and operated by K-F Environmental Technologies, Inc. After biosolids treatment, the material referred to as Kentorganite is turned back to the County for application on local farmland as a fertilizer and soil amendment.



KEY REASONS FOR IMPLEMENTING AN EMS

Kent County sought to implement an EMS because the county not only wanted to be a better environmental steward, but also wanted to reduce its emissions, improve operational safety, and optimize both its resources and the quality of the system's byproducts. The following were initial goals defined by the organization:

KENT COUNTY EMS ORGANIZATIONAL GOALS

1. Maintain compliance with all permits (NPDES, CAA, Biosolids, etc.).
2. Reduce emissions into air, water, etc.
3. Optimize nutrient loading from Kentorganite on local farms.
4. Improve plant safety.
5. Optimize the use of operational resources (funds, personnel, etc.).
6. Be in a better fiscal shape to lower bond and insurance costs.
7. Build a better working relationship with K-F Environmental Technologies (biosolids contractor).
8. Be an EMS leader within the State of Delaware and Kent County, particularly with respect to other governmental agencies and local industries.
9. Be a better environmental steward.
10. Improve relationships with general community and other interested stakeholders.
11. Be better able to handle job succession issues such as the transfer of "Tribal" Knowledge".
12. Receive third party certification under ISO 14001 and 18001, and the NBP program.

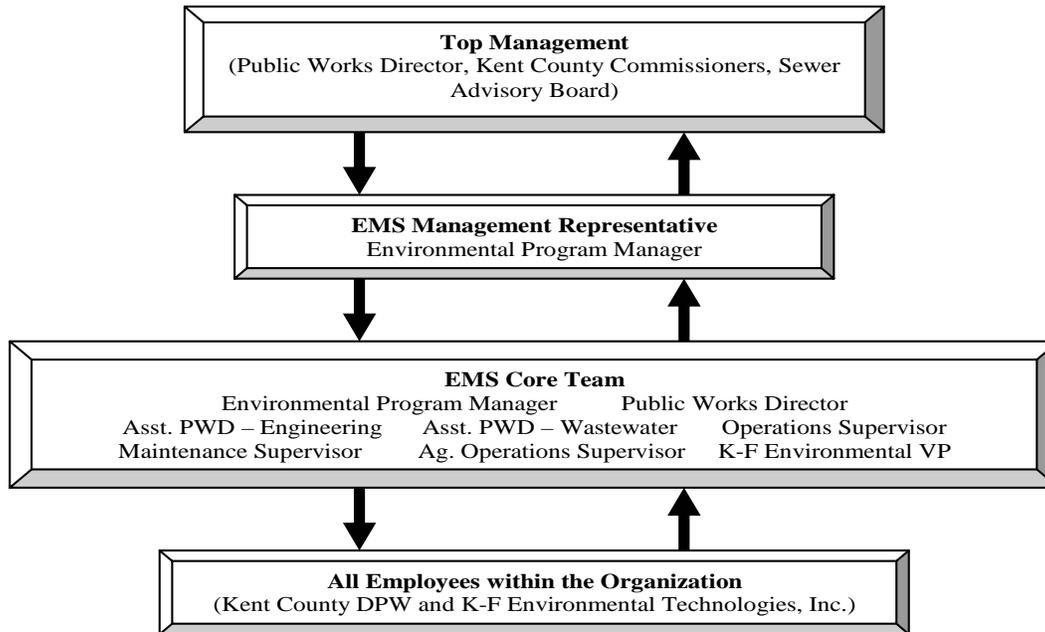
EMS CORE TEAM STRUCTURE

Kent County initially recruited personnel for their EMS Core Team by placing "teaser" posters about EMS in order to promote curiosity and interest. This also served as a valuable awareness building tool within the organization. Based upon responses, management gauged the level of interest and defined the initial Core Team. The EMS core team is made up of eight members, including area managers from each distinct operational area, with the Environmental Program Manager designated as the EMS Project Manager or "Environmental Management Representative (EMR)". Top management is actively involved in all core team activities, including regular participation by the Public Works Director and Assistant Public Works Director.



Kent County selected Jim Newton, Environmental Program Manager, to lead the EMS implementation. Mr. Newton holds a bachelor's degree in engineering science and master's degrees in both engineering science and civil engineering. Mr. Newton joined Kent County in 2002 and became the internal champion for EMS implementation from past experience within a chemical engineering company. Prior to EMS implementation, Mr. Newton's responsibilities included tracking new and revised regulations, revising the County Standards and Code, pretreatment coordination, and managing the County's Fats, Oils, and Grease (FOG) Program. Mr. Newton has over 27 years of professional experience and is a licensed environmental engineer in 14 states.

The following EMS chart details the basic team structure:



ENVIRONMENTAL POLICY

Kent County developed their initial Environmental Policy after a year of EMS implementation, opting to defer until after the environmental aspects and impacts were identified. This is an approach that many organizations have selected, which allows an organization to develop a more specific Environmental Policy, one that truly captures the mission and unique characteristics of a particular organization.

In this case, Kent County developed a combined policy that included a clear commitment to include their biosolids operations and comply with the NBP Code of Good Practice. As part of the first round EMS Management Review, the County decided to expand their EMS to include Safety and Health as well. When this decision was confirmed, they rightly decided to review their policy and add in the expanded commitment to safety and health and ensure that the new policy was officially signed by the Levy Court (see p. 28 for a copy of the Policy).

Environmental/Biosolids Policy



- Comply with regulations and NBP Code of Good Practice
- Have an environmental/biosolids vision
- Improve continuously
- Readily share information
- Practice pollution prevention

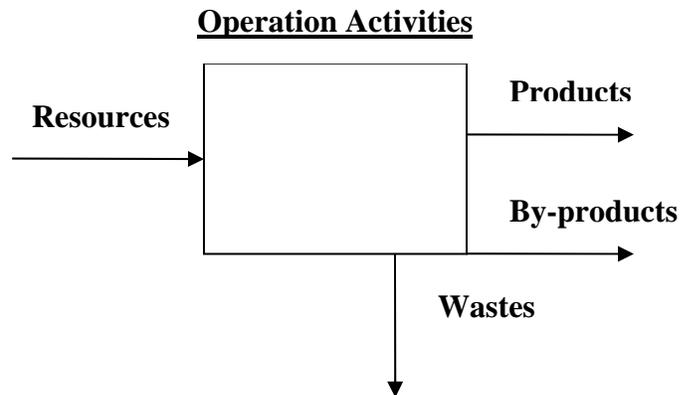
Adopted by Levy Court on December 9, 2003

SIGNIFICANT ASPECTS & IMPACTS

The Environmental Aspect and Impact element of EMS implementation is the step where organization’s asses the operations, services, and activities within their EMS fenceline and identify how each positively and negatively affects the environment. The

result is most commonly a list of environmental aspects (how you interact with the environment) and impacts (actual impact on the environment) that helps an organization visualize their “environmental footprint” and focus in on the most significant impacts. Kent County utilized a systematic approach to identifying their significant aspects and impacts, which included shared responsibility among each member of the Core Team. The County took the following steps in the aspect identification process:

1. Each area manager was tasked to identify all activities that occurred under his/her direction. In doing so, each manager was asked to fill out an Input/Output diagram for each central activity. This approach allows for easy identification of impacts, waste, and byproducts. Area managers used operations personnel to assist in preparation of the I/O charts as they are the people that conduct activities and know them “in and out”.



2. The EMS Core Team, as a group, conducted a review of submitted I/O diagrams and developed a list of aspects relevant to each activity. The lists of activities and associated aspects were put together into a single table, which resulted in a list of 95 total environmental aspects.

3. Environmental impacts were identified and ranked for each individual aspect based upon the following list:

- Changes in air quality
- Changes in water quality
- Direct exposure to agent
- Changes in habitat
- Nuisance (including odor)
- Conserves/depletes resources
- Frequency/probability
- Regulated
- Critical control point (NBP designation)
- Recently added Energy, and Health and Safety as additional factors to be included in rankings.



4. The Core Team determined the significance of each environmental aspect by using the best professional judgment with respect to the impacts associated with each aspect, assigning a value from 0-5 for each aspect (with 0 being no impact and 5 being major impact). Where there was disagreement between the Core Team, they used an average score. A regulated activity received a ranking of 5 within that impact area and an unregulated received a 0. Because of Kent County’s simultaneous involvement in the National Biosolids Program, Critical

Control Points (CCP), as defined by the program guidelines, received an additional rating of 3 and non-CCP received a rating of 0.

The initial ranking of aspects was conducted by the Environmental Management Representative for efficient use of the Core Team member's time. The Core Team then met to evaluate and "truth test" the rankings of all environmental aspects and determine which should be designated "significant".

Based upon the Core Team discussions, Kent County designated the following as their initial significant aspects:

| Environmental Aspects |
|--|
| Spreading of Kentorganite |
| Running dryer scrubber |
| Running dryer boiler |
| Kentorganite spills |
| Sanitary sewer overflows – force mains |
| Running the dryer |
| Sanitary sewer overflows – pump stations |
| Changing chlorine cylinders |

EMS OBJECTIVES, TARGETS, AND PROGRAMS

Based upon the identification of significant environmental aspects, Kent County developed the following Objectives, Targets, and Programs to promote and measure environmental performance.

Objective: Reduce air pollution

| Target | Program(s) |
|--|---|
| Reduce sulfur, particulate and CO emissions by 50% from CY 2002 levels | <ul style="list-style-type: none"> ▪ Develop Operational Controls for Biosolids Operations focused upon consistency in process among all shifts. ▪ Replace 75% of Diesel Usage with Biodiesel in Operating Equipment. ▪ Replace Emergency Generator Diesel Fuel with Biodiesel. ▪ Obtain approval from state regulatory agency (DNREC) to allow generator load sharing. ▪ Replace Dryer Diesel Fuel with Bio-Fuel Made from Grease |

| Target | Program(s) |
|--------|--------------------------|
| | Trap Waste or Biodiesel. |

Objective: Reduce energy consumption

| Target | Program |
|---|--|
| Reduce electricity usage by 20% from CY 2002 levels | <ul style="list-style-type: none"> ▪ Enroll in EPA Green Lights Program. ▪ Obtain approval from state regulatory agency (DNREC) to allow generator load sharing. ▪ Upgrade to more Energy Efficient Pumps, Lights, etc. ▪ Seek Renewable Energy Alternatives such as Wind. |

Objective: Reduce or eliminate effects of chlorine and sulfur dioxide

| Target | Program |
|--|---|
| Improve safety of existing processes or switch to an alternative disinfection method | <ul style="list-style-type: none"> ▪ Develop Operational Controls for Current System. ▪ Evaluate Chlorine Hazard Potential ▪ Hire Consultant to look at Cost Effective Alternatives ▪ Develop Plans for Alternatives or Ways to Improve Safety of Current Systems ▪ Budget Finances ▪ Secure Financing ▪ Operate |

Objective: Reducing sanitary sewer overflows

| Target | Program |
|--|---|
| Reduce SSOs by 40% from CY 2002 levels | <ul style="list-style-type: none"> ▪ Develop System to Document Sources of SSOs. ▪ Implement Fats, Oils, Grease (FOG) Program. ▪ Develop Action Plans to Reduce or Eliminates SSOs. ▪ Develop CMOM Program. |

BENEFITS OF ADOPTING AN EMS

Energy Savings

Kent County's annual electric bill exceeds \$600,000 and they want the EMS to reduce their electric load. Under serious consideration is installing a renewable energy system using wind to replace electricity generated by local power plants. The County is currently in the process of collecting a year's worth of wind data to fully assess the project's potential. The County is also pursuing the construction of an on-site bio-gas facility with a local cooperative partner and generator load sharing.

Expected Benefits:

- Reduce the plant's electric costs by \$200,000 - \$300,000 per year.
- Reduce air pollution by 5 million pounds of CO₂ per year, the equivalent of taking 500 cars off the road, as measured at the power plants generating the electricity that has been deferred.

Employee Succession

Like many wastewater agencies throughout the U.S., Kent County has several operators that have been on staff for over 30 years. The County estimates that one-third of the workforce, with decades of practical experience, will retire in the next five years. The EMS ensures regular training, transfer of "tribal" knowledge from long time staff to new employees, and consistency in best management practices among all shifts. Kent County has successfully recorded critical processes or activities via flow charts, work instructions, diagrams, and even photographs! In addition, this presented a great learning opportunity for the EMR and Core Team members to learn the in's and out's of the organization's activities. A part-time EMS intern shadowed employees conducting covered activities, asked questions about procedures, drafted operational controls and standard operating procedures, and truth tested them with employees.

Reduction in Air Pollution

Kent County has switched from Fuel Oil No. 2 to B20 biodiesel as a fuel source for its emergency generators and is considering a switch to B20 for all of its diesel fleet and potentially as the primary fuel for its biosolids heating system. Collectively, the County uses approximately 300,000 gallons of fuel per year.

Expected Benefits:

- 20% reduction in hydrocarbon emissions.
- 12% reduction in carbon monoxide emissions.
- 12% reduction in particulate emissions.

Improvements in the Chlorine Delivery System and Management

The EMS has established controls for the operation of the chlorination/dechlorination system operating at the plant, ensuring that chlorine and sulfur dioxide cylinders are changed out using the same process for all three shifts providing the most employee and public health protection possible. The EMS has begun to evaluate alternatives to the current system as a part of its continuous improvement program. The controls utilize "Tribal" knowledge gained by operators who currently have 25-30 years experience to ensure that the operation meets all standards.



Sanitary Sewer Overflow Reductions

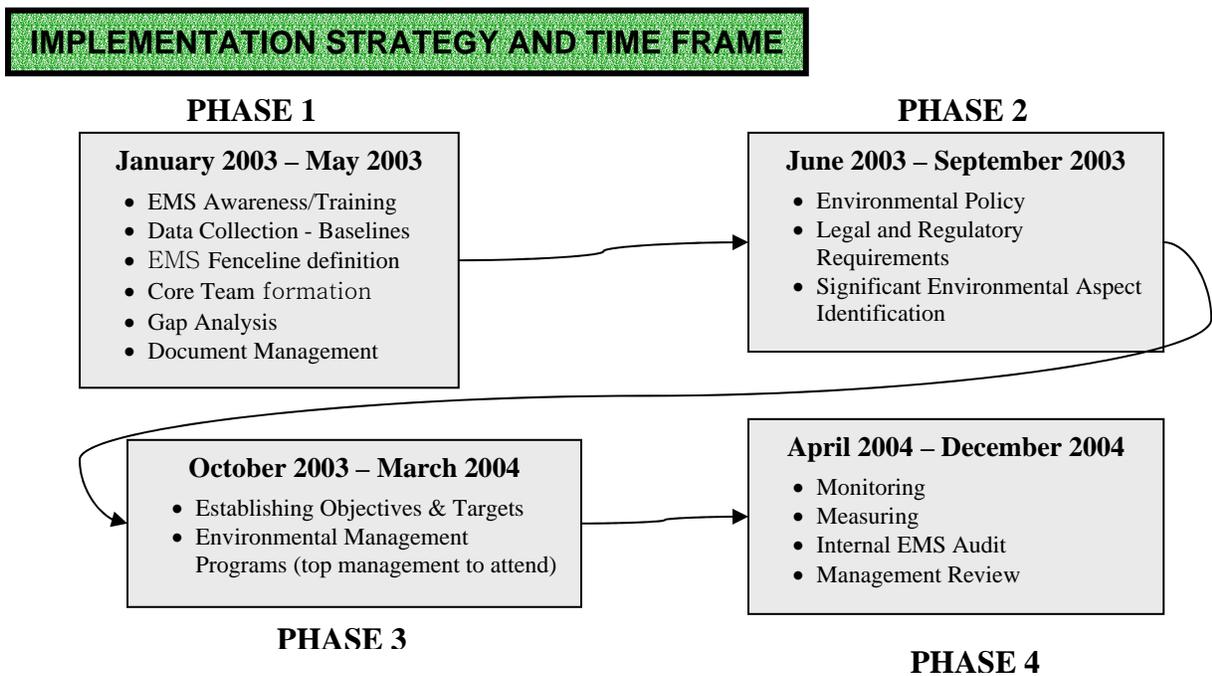
Sanitary sewer overflows (SSOs) are a serious problem operating any sewage collection system. The EMS has helped to emphasize the importance of reducing these events. A fats, oils and grease (FOG) reduction program has been established within County Sanitary Code requiring food service providers to acquire a permit for grease traps and interceptors. For 2004, an 85% reduction in SSOs from 2002 levels has occurred.

Improved Public Image

Another benefit of the EMS program has been improved public visibility of the treatment plant. The plant was awarded a National Association of Counties (NACo) 2004 Achievement Award, placed second in the 2004 Clean Water Act Recognition Awards for its Pretreatment Program, and was named one of five Facilities of the Year by Environmental Protection magazine for its FOG program. A website that provides information on the EMS has had approximately 1,000 visitors. Representatives of the department have given numerous presentations at regional and national conferences about the EMS. A local citizens committee has been established to oversee the EMS and provide input into the EMS targets and objectives.

Be an EMS leader within Delaware and Region

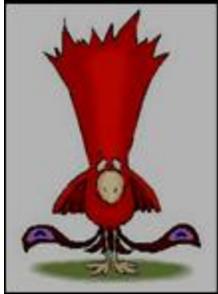
As a result of participation in the EMS, the County has made numerous presentations on the program. The presentations have included several Water Environment Federation (WEF) conferences including the Biosolids Specialty Conference and WEFTEC. Representatives of the County serve on the WEF EMS Committee, have served on the Steering Committee for a major EPA publication regarding EMS development and implementation at wastewater facilities, and assisted with an EMS training session sponsored by the Delaware Dept. of Natural Resources and Control (DNREC) promoting EMSs at other public agencies. The County has established a web page devoted to the EMS that includes Adobe Acrobat versions of the major EMS procedures.



As a participant in two national pilot projects, the 3rd EMS Initiative for Public Entities and the National Biosolids Partnership, Kent County followed a structured approach to EMS implementation. The basic approach was broken down into 4 distinct faces, with each phase requiring completion of detailed tasks and documentation, over a 24 month period. The County started implementation in January 2003 and complete their initial internal audit and management review in late December 2004.

OUTREACH

Kent County has made external communication a central component of their EMS implementation, utilizing the following main strategies:

- 1) **EMS Graphic Identity:** To promote consistent recognition and give the EMS efforts an identity, the County developed a cartoon figure called CHIRP. The word is an acronym that forms the basis of their Environmental Policy. This mascot has since been used on all EMS related internal and external outreach, including on coffee mugs, mouse pads, magnets, brochures, the website, etc...
- 
- 2) **Sewer Advisory Board:** The Board is made up of citizen representatives with the responsibility of advising the Commissioner on sewer-related issues. Kent County leveraged the existence of this group and designated them as the County's Public Awareness Committee for their EMS under the National Biosolids Program. The county provides monthly updates to the Board during scheduled meetings and has conducted EMS awareness training to promote thorough understanding and communication.
 - 3) **EMS Website:** The County developed, during the relatively early stages of EMS implementation, a website devoted to their EMS related efforts. On this website, the interested parties can find updated information including the Environmental Policy, EMS procedures, presentations, lists of significant aspects, objectives and targets, and benefits. The site provides a central clearinghouse of information for both internal and external purposes, http://www.kentcountypw.com/kent_county_environmental_manage.htm.

RESOURCES REQUIRED TO IMPLEMENT/MAINTAIN THE EMS

Internal Labor -- One complete cycle of EMS implementation, over a 24-month period, required Kent County to commit 2,985 total direct labor hours at a cost of approximately \$101,681. This number represents the direct labor hours employees performed in addition to their regular duties

ISO Registrations and Audits -- Kent County plans to pursue ISO 14001 (Environmental Management System) and 18001 (Occupational Safety and Health) Registration by Fall 2005, as well as certification to the National Biosolids Program Guidelines. Based on the costs incurred by other local governments and initial estimates from the selected auditor, Kent County estimates the registration process will

cost approximately \$30,000 for a 3-year combined (ISO 14001, 18001, and NBP) audit cycle (\$15,000 for the ISO 14001/18001 and \$15,000 for the NBP).

Other Material Costs -- Kent County spent approximately \$3,237 on other materials during implementation including EMS software, promotional materials (i.e., magnets and mugs), and graphics. Participation in the national EMS pilot project also required travel and related costs for workshop participation.

3RD PARTY VERIFICATION

The County will seek third party certification for its EMS not only through ISO 14001 registration, but as a member of the National Biosolids Partnership in November 2005. The county is also working to integrate occupational safety and health measures to meet the ISO 18001 Standard, which would offer an additional registration and recognition opportunity. This decision was reflective of a direct recommendation from Levy County Court to expand the original scope of the EMS to include health and safety. The County is currently setting their sites on a combined, single external audit that will cover all three elements of their management system. Kent County has selected a firm with the unique capability of providing auditing services that meet the ISO 14001, ISO 18001, and National Biosolids Program guidelines.

"The benefit of having third party certification for our EHS-MS program is to add legitimacy to it in the eyes of our employees, constituents and the general public. It makes no sense to expend the resources to develop and implement the EHS-MS program and not add a way to show it is more than just a program of the month. The cost of the audits are outweighed by the goodwill and credibility gained through them."

Jim Newton
Environmental Program Manager

KEYS TO SUCCESS/BARRIERS/LESSONS LEARNED

Kent County's EMS implementation was characterized by a high level of commitment up, down, and throughout the organization, which was maintained from beginning to end. Like many organizations, Kent County found that achieving and maintaining momentum behind the EMS was the key to success. During the interview for this case study, Jim Newton, Environmental Management Representative, commented that "establishing momentum towards accomplishing the tasks was critical. It's like rolling a boulder down the hill. It takes quite a bit of effort to begin to make it roll, but it quickly gathers momentum as it rolls." Kent County also found that communication is essential to all involved in EMS implementation, including outside contractors. Realizing this early on and because their unique approach to EMS included a private, on-site partner, Kent County included outside contractors on their Core Team.

"The EMS has helped us improve internal communication, problem detection and solution, teamwork, expedited decision making and job/task completion. It is time consuming, but also has its numerous rewards."

Reinhold Betschel
Assistant Public Works Director –
Wastewater Facilities



Top 3 Keys to Success

1. Active senior management support. Kent County's Assistant Public Works Director participated in nearly every Core Team meeting and was instrumental in decision-making. In addition, the Public Works Director was also actively involved attending several Core Team meetings, training sessions, and conducting community outreach. Whenever the EMR called on them their support was there.
2. Committed Core Team that understood the program and desired to see it completed.
3. Participating in the U.S. EPA supported national initiative and NBP Program allowing Kent County to learn from prior participants and utilize the knowledge and guidance provided by GETF technical assistants.



Top 3 Barriers

1. It is important not to take too long to "roll out" the program and implement the EMS. The first cycle should take 1.5-2 years. Early momentum is key. Kent County utilized an early poster campaign to spark interest among staff and followed this up with active engagement of the Core Team. The EMRs enthusiasm for the program also resonated throughout the organization.
2. It proved more difficult than originally expected to facilitate the private-public partnership and to keep all team members on the same page and committed. Kent County's private partner, K-F Environmental, Inc., remained supportive throughout the implementation, attending workshops and meetings, but faced difficulty due to high intensity, limited staff required operations.
3. Many organizational layers have to agree to participate in the program, internal and external. The Directors awareness and active involvement were important, especially in promoting the program to the County Board and advisory committee. Additionally, the organization made a good decision to include area manager's on the Core Team which created direct communication links throughout the organization.



Top 3 Lessons Learned

1. It's important to undertake the project using the assistance of practitioners and experienced technical assistance providers and take advantage of Federal and/or state supported programs. Kent County participated in the 3rd EMS Initiative for Public Entities and the National Biosolids Partnership program, both

national EMS pilot projects supported by the U.S. Environmental Protection Agency.

2. Active senior management involvement throughout the project, even before implementation actually begins, such as participation on the Core Team.
3. The EMR or a representative (such as our EMS Intern) must interact with team members on an almost daily basis, especially during the first stages of EMS implementation. Kent County relied heavily, especially during the second year of implementation, on the assistance of an intern that happened to be studying towards her masters in the use of EMS as a management tool. With a flexible schedule, the intern was able to spend quality time with individual team members, identifying and detailing critical steps in controlling environmental impacts. In addition, the close working relationships resulted in EMS dialogue and awareness building throughout the staff.

NEXT STEPS

Kent County will continue developing its EMS and advance its environmental targets. The County will seek third party certification for its EMS not only through ISO 14001 registration, but as a member of the National Biosolids Partnership in November 2005. The county is also working to integrate safety and health measures to meet the ISO 18000 standards, which would offer an additional registration and recognition opportunity. In addition, the County continues to look for opportunities to promote EMS and showcase their achievements throughout the region.

Kent County is also in the development stage of a program referred to as the Pretreatment Environmental Excellence Program (PEEP), which will potentially offer regulated industries an opportunity for reduced sampling, fines, and application fees, as well as recognition awards for installing an EMS to cover pretreatment operations.

In addition, Kent County has formed a Pretreatment Advisory Workgroup (PAW) in order to continue outreach for the EMS to interested stakeholders.

ADDITIONAL INFORMATION

For additional information on Kent County's EMS experience and progress, please contact:

Jim Newton
139 Milford Neck Road
Milford, Delaware 19963
302-335-6000
james.newton@co.kent.de.us

In addition, Kent County maintains an up-to-date website devoted solely to their EMS implementation:

http://www.kentcountypw.com/kent_county_environmental_manage.htm.

Kent



County

Commission Members
David R. Burris, President
Ronald D. Smith, Vice-President
Allan F. Angel
P. Brooks Banta
Donald A. Blakey, Ph.D.
Richard E. Ennis
Harold J. Peterman

Levy Court

414 Federal Street
Dover, Delaware 19901-3615
(Handicapped Accessible)
(302) 744-2305
FAX (302) 736-2279

Environmental/Health and Safety/Biosolids Policy.

- A. The Kent County Levy Court commits to reduce the impact of its operations on the environment, by adopting the International Organization for Standardizations (ISO) 14001 Environmental Management Systems standards, the International Organization for Standardizations (ISO) OSHAS 18001 Occupational Health and Safety Management Systems standards, and the National Biosolids Partnership (NBP) Code of Good Practice for the wastewater collection and treatment facility operations directed by the Department of Public Works. In addition, the Levy Court requires all public works contractors employed at the covered facilities to abide by this Policy to the maximum extent practicable.
- B. The Levy Court commits to:
- (1) Comply with all applicable environmental laws and regulatory requirements, to the NBP Code of Good Practice, appropriate occupational health and safety practices, and any other requirements to which the organization subscribes;
 - (2) Have an environmental, health and safety and biosolids vision and mission, then develop/achieve the objectives and targets to implement this mission;
 - (3) Improve continuously, through the EHS-MS, the management of the environment, employee health and safety, wastewater effluent and biosolids product;
 - (4) Readily share its wastewater operations, health and safety, and biosolids information with interested stakeholders; and
 - (5) Promote pollution prevention activities, including energy conservation, and appropriate health and safety practices.

David R. Burris
President, Kent County Levy Court

Mar 31, 05
Date

“Serving Kent County With Pride”

EMS CASE STUDY # 2

NATICK DEPARTMENT OF PUBLIC WORKS ***Springvale Water Treatment Facilities***

Organizational Profile/Background

The Town of Natick Massachusetts was founded in 1651 and incorporated in 1781. The Town is located in eastern Massachusetts roughly 17 miles west of Boston along the Charles River. The Town's population is an estimated 32,000 people.



Natick is a representative town government managed by a Board of Selectmen and Town Administrator. The Board of Selectmen is composed of five members who are elected for three-year terms. As the Chief Elected and Executive Officers of the Town, the Selectmen are vested with all the municipal authority not specifically retained by the Town's legislative body. The Selectmen appoint a Town Administrator, responsible for the daily management of the Town, whose powers are specified in the Town of Natick Home Rule

Charter. The Town Administrator is responsible for the management of all Town departments (excluding the School Department), all Town funds, for providing support to the volunteer committee system, working with other levels of government, and managing special projects for the Board of Selectmen.

The Department of Public Works is made up of eight operational divisions: Administration, Engineering, Building Maintenance, Equipment Maintenance, G.I.S. / Water, Highway, Water and Sewer, and Land Facilities and Natural Resources.

EMS FENCELINE SELECTED

Natick selected the Springvale Water Treatment Facilities as their initial EMS fenceline. The

Treatment Facilities include the following operations:

- Springvale Water Treatment Plant
- Drinking Water Pumping Facilities
- Drinking Water Production Wells
- Drinking Water Distribution System
- Sanitary Sewer Pumping Facilities

The Department of Public Works maintains and operates the Town's Water Treatment and Sewer system, building maintenance and engineering functions to support both. Although separate divisions for budgetary purposes, water and sewer personnel and equipment are considered a single division for operational purposes. The Town's system serves the population of approximately 32,000. The treatment system consists of three satellite water supply wells, two water storage tanks, 36 sewer stations, one

water booster pump station, and all mechanical parts for the water distribution system. The Sewer and Water Division currently employs 26 staff members to operate and maintain the town's water treatment plant, water wells, and sewer pump stations.

The Division is responsible for maintaining and replacing the miles of sewer and water mains as well as 1,400 fire hydrants throughout the town. Water meter calibration, supervision of water meter installations and supervision of water meter readers as well as inspection and testing of backflow prevention devices are other areas of responsibility. The water is tested on a weekly basis. Personnel from this division are on call twenty-four hours per day, seven days a week to respond to emergency calls for water line breaks and sewer backups. State and Federal regulations strictly control the operation of a public water supply system and sanitary sewer system. As a result, there is a tremendous amount of paperwork handled by this division. These regulations also require certain employees to be properly certified in the field of water supply, which requires extensive training, experience and testing.

KEY REASONS FOR IMPLEMENTING AN EMS

Natick sought to implement an EMS because the Town wanted to be a leader in environmental stewardship, but also to ensure safe and effective management of chemicals and hazardous materials to safeguard the community and staff. The following were initial goals defined by the organization:

NATICK EMS ORGANIZATIONAL GOALS

- Comply with applicable environmental laws and regulations of the jurisdiction within which we operate;
- Honor the requirements of all the environmental initiatives that we enter into;
- Continuously seek opportunities to improve adherence to our environmental, health, and safety principles;
- Recognize that proper and responsible handling of our chemicals, materials and equipment, together with effective operating procedures, are imperative to reduce risks and protect the environment; and
- Continuously improve our environmental performance; and implement pollution prevention measures as our means of improving our environmental performance.

An additional EMS driver was compliance with an Administrative Agreement and Order issued by the U.S. EPA in November of 2001. Pursuant to this Order, the Town was given three years to complete over 24 pollution prevention projects, Town-wide. The projects are collectively called the Supplemental Environmental Project (SEP) and included a formal Pollution Prevention Plan. Under this Agreement, the Town committed to conduct its operations in a manner that does not cause significant impact to the environment, while maintaining compliance with applicable regulations. EMS implementation naturally became a central strategy to accomplish this and integrate this commitment into everyday operations to make it business as usual.

During the case study interview, Bob Bois (see EMR Profile below) defined several drivers for why he, as the Town's Compliance Officer, championed the EMS approach for Natick:

- Integration of environmental regulations into operations.
- As Compliance Officer, an EMS facilitates the tracking of relevant environmental regulations and applicable changes, especially in the heavily regulated water sector.
- An increased sense of control over operations – everyone is trained to handle their responsibilities effectively and efficiently and the EMS process ensures that procedures are followed in every instance.
- Bottom-line savings for the Town, mostly through reduced waste and operational efficiencies.

“Coming from a regulatory enforcement background, I experienced a real “epiphany” in realizing how effectively an EMS integrates regulations into everyday operations”.

Bob Bois
Environmental Compliance Officer

EMS CORE TEAM STRUCTURE

Natick's EMS core team is made up of nine members, with the Environmental Compliance Officer designated as the EMS Project Manager or “Environmental Management Representative” (EMR). The Town leveraged an existing team structure involving all department heads, termed the “Oversight Committee” to serve as strategic advisors to the Core Team. This approach allowed for existing team chemistry and comfort, especially with problem solving situations.

Due the continuous nature of operations and requisite staff responsibilities, the team had to be creative and strategic with meetings. During early implementation efforts, the night operator for the water plant came in an hour early one day a week to meet with the EMR and draft procedures and work plans. The operator was provided overtime and maintained this arrangement for approximately four to five months to ensure a successful beginning to implementation. This approach also provided for consistent EMS communication throughout the varying shifts.



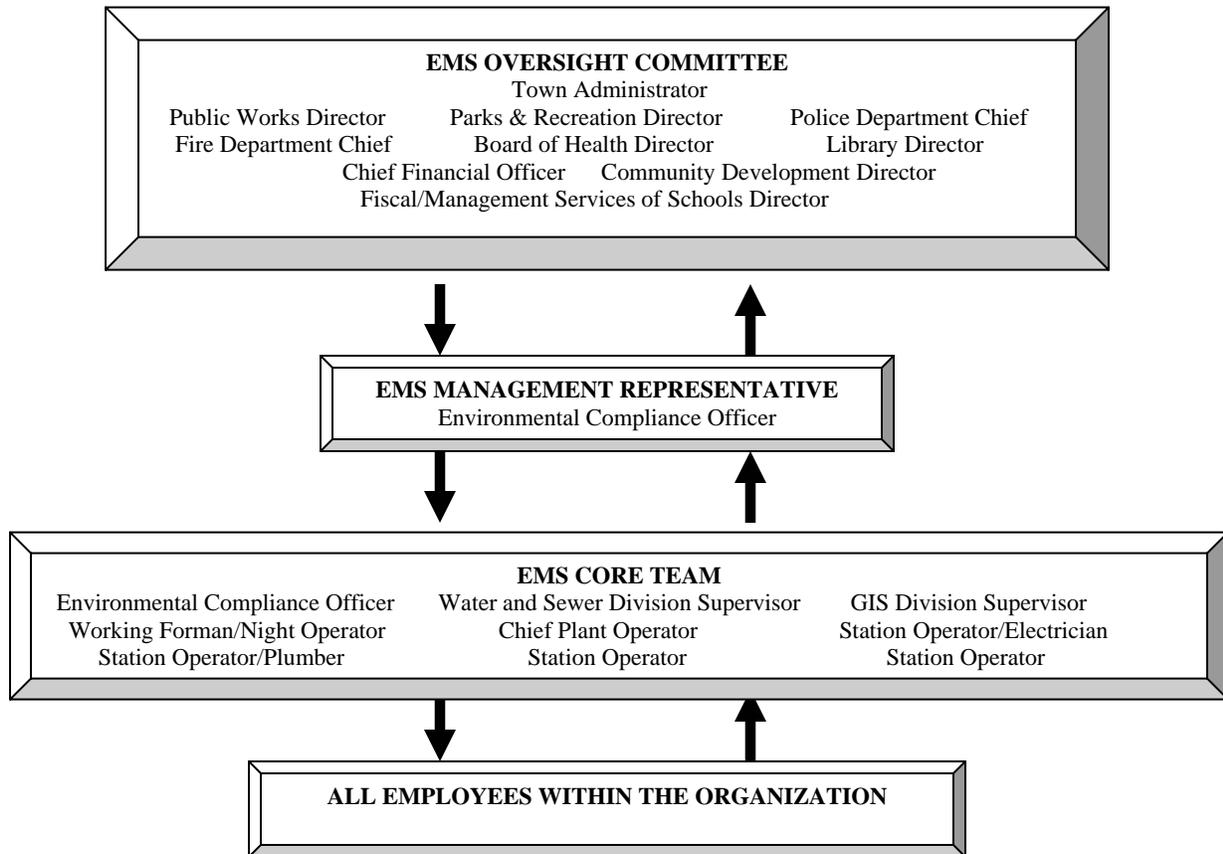
As the EMS has matured, Natick has maintained the same basic team structure and personnel. The team meets less frequently, but focuses on core EMS components, such as reviewing the Environmental Policy, assessing environmental aspects and impacts, status of objectives and targets, and management review.



Natick selected Bob Bois, Environmental Compliance Officer, to lead the EMS implementation and serve as Environmental Management Representative (EMR). The Town hired Mr. Bois in

February of 2002 to help comply with the U.S. EPA Administrative Agreement and Order. In addition to complying with the Agreement, Mr. Bois is responsible for helping Town Departments comply with a myriad of environmental regulations like filing the appropriate air source registrations for emissions from furnace boilers or meeting mandated clean-up schedules on Town-owned contaminated property. As Environmental Compliance Officer, he is also the Town's Conservation Agent helping the Conservation Commission oversee and enforce the Town's Wetland Bylaw and Regulations.

The following chart details Natick's EMS team structure:



The majority of the implementation work was conducted by the EMS Core Team (or Implementation Team) and the EMR. The EMS Oversight Committee was utilized in an advisory capacity, focused upon monitoring EMS progress and allocation of resources. The Committee also served a fundamental problem solving role when the EMS encountered unexpected barriers.

ENVIRONMENTAL POLICY

The Natick Water and Sewer Division developed their initial Environmental Management Policy prior to formally starting EMS implementation. The Policy listed the EMS organizational goals (see Executive Summary) and was signed by the Town Administrator on December 19, 2002. This Policy represented a commitment to

provide safe and potable drinking water to the Town's residents while protecting the environment and maintaining a safe work situation for its employees.

In February 2003, the Town of Natick signed an Environmental Policy Statement declaring the Town's commitment to reduce environmental impacts and protect the local community. The statement is as follows:

ENVIRONMENTAL POLICY STATEMENT FOR THE TOWN OF NATICK

It is the policy of the Town of Natick, Massachusetts to consistently seek out opportunities to reduce or eliminate, to the extent possible, the use of toxic chemicals and generation of wastes.

It is our goal to safeguard the environment and provide a safe and healthful work environment for our employees while undertaking the Town's responsibility to serve the residents of our Town.

The Town's first priority is to integrate pollution prevention into all its activities, appropriate to the Town's goal of preventing pollution at the source. Where waste cannot be avoided, we will seek to use environmentally preferable purchasing, reuse, recycling, treatment and disposal in ways that minimize undesirable impacts to air, water and land.

Adopted February 24, 2003, by the Natick Board of Selectmen

To further promote the Town's related Pollution Prevention projects, the Town also developed a Recycled Product Procurement Policy (see Appendix A) signed into effect by the Board of Selectmen on February 24, 2003. The Policy recognized the Town's commitment to make more efficient use of natural resources, create markets for the materials collected in recycling programs, reduce solid waste volume and disposal cost, and serve as a model for private and public institutions.

SIGNIFICANT ASPECTS & IMPACTS

Natick utilized a logical approach to identifying their significant aspects and impacts, which included shared responsibility among each member of the Core Team. In December 2002, the Core Team received a two-day training session on identifying, evaluating, and ranking environmental aspects based upon the following steps:

1. The Core Team identified the following list of activities involved in producing drinking water by using a flow chart approach:
 - Extracting and pumping ground water to treatment
 - Treating ground water
 - Storing and distributing ground water
 - Maintaining the storage and distribution system
 - Testing, monitoring, and recording
 - Pumping and collecting wastewater
 - Responding to emergencies
 - Receiving and transporting chemicals
 - Maintaining operation buildings

2. The Core Team then identified aspects and impacts associated with the defined activities centered upon what was utilized (i.e., electricity, chemicals, solid waste, parts, etc...). As the team went through this process they noted the reoccurrence of several aspects and impacts and realized that collectively certain aspects and impacts have large overall effects. Based upon this realization, the Team decided to combine reoccurring aspects and impacts into single categories. For instance, they realized that chemical releases came up as an aspect in a variety of activities. This step of consolidating resulted in a final list of approximately 100 aspects.
3. The list of aspects were then scored among 5 weighted severity criteria:
 - Human health
 - Affect on product
 - Flora and fauna
 - Regulatory concerns
 - Public perception

The resulting severity score was then multiplied by a likelihood factor to achieve the total significance score for each individual aspect.

4. The Core Team determined a significance cutoff score based upon the number of significant aspects able to be reasonably managed. The result was the following list of significant aspects:
 - Chemical releases
 - Regulatory compliance
 - Worker safety
 - Sustainable (protect) resources
 - Sustainable (efficient) operations

EMS OBJECTIVES, TARGETS, AND PROGRAMS

The following list of Objectives and Targets were selected by the EMS team to address its

significant aspects and its Legal and Other Requirements and are consistent with the commitment made by top management in the Environmental Management Policy for the Springvale Water Treatment Facilities:

| Objectives | Targets |
|--|--|
| Prevent Chemical Releases | No more than five liquid/solid chemical spills or releases per year |
| Prevent Compliance Issues | No spills or releases of chemicals above regulatory reporting concentrations |
| Improve Worker Compensation Statistics | Maintain noise in the office space at the Springvale Water Treatment Plant to less than 70 db by December 2005 |

| | |
|---|--|
| | Eliminate confined space in the sewer station work place by 2007 |
| Protect the Aquifer as a Sustainable Resource | Train emergency response teams to protect storm water drainage in Zone II of town drinking water wells by Dec 2005 |
| Maintain Sustainable Operations | Eliminate the use of chlorine gas as a treatment chemical at the treatment plant by December 2005 |
| | Eliminate confined space in waste water pump stations by FY 2007 |

It is worth noting, as a key lesson learned, that the Core Team originally developed a list of 19 Targets for the above five Objectives. This list was developed through the Core Team brainstorming all of the things they could do without fully considering the workload created to properly plan, implement, and track each of the targets. Once the decision was made that they could not effectively pursue all 19 targets the team collectively narrowed the list down to the seven listed above.

For each individual Objective and Target combination identified in the above table, the Core Team created an *Environmental Management Program Planning Form* to identify a systematic approach for ensuring that the organization progresses towards the defined goals. Each form identified specific roles and responsibilities, including the “owner” or primary responsible party for specific actions, as well as due dates and milestones. In addition, each plan attempted to estimate the internal and external resources required for individual actions leading to the identified target. To ensure the desired performance, each plan also included a list and frequency of monitoring and measurement indicators (i.e., list of chemicals, training certification log) and associated action items.

BENEFITS OF ADOPTING AN EMS

Cost Savings

Approximately \$40,000 in costs was avoided because an EMS standard operating procedure alleviated the need for back-up equipment (regulatory requirement). The regulatory agency determined that because Natick had a documented procedure, requisite competency training, and could show through auditing that the procedure had been implemented in practice, they fulfilled the regulatory requirements and were provided a waiver from needing to implement or install back-up equipment.

Natick has experienced a range of increased efficiencies and greater overall operational consistency. Due to the U.S. EPA Enforcement Order and required Pollution Prevention Projects, it was difficult for Natick to fully differentiate EMS specific savings from overall pollution prevention benefits.

Improved Compliance

Natick has experienced improved ability to meet compliance requirements. As a drinking water treatment plant, operations are heavily regulated by both state and federal agencies, but commonly only limited guidance is provided regarding the integration of regulations into day-to-day operations. Natick realized that an EMS accomplishes this. The legal and other requirement elements of an EMS allowed Natick to consolidate their requirements into a single list, develop a procedure for identifying

“As Compliance Officer, trying to fully keep track of water regulations is nearly impossible. An EMS has made control a lot easier. I now feel that if we do what we have trained to do, compliance will be met and everything will be fine”.

Bob Bois
Environmental Compliance Officer and EMR

and monitoring applicable requirements, delegate roles and responsibilities, and ensure that requisite personnel are provided with knowledge and training. Collectively, this has provided Natick with enhanced confidence that they are operating within statutory and regulatory requirements.

Environmental Responsibility, Awareness, and Leadership

Due in large part to their EMS, Natick has improved environmental awareness, involvement, and competency of staff throughout the department and has positioned the Water and Sewer Division as an environmental leader and steward. This particular case study is a prime example, as Natick was selected as one of five participating organizations in the United States. Not only has Natick embraced this leadership role as one of only a handful of water sector EMS practitioners, it is also a showcase organization among the growing number of sustainability initiatives within Massachusetts. The combined results of the Springvale Water Treatment Plants EMS efforts and the 24 Pollution Prevention Projects, including schools, administrative offices, and household solid waste, has positioned Natick as a model of cross-operational sustainability.

IMPLEMENTATION STRATEGY AND TIME FRAME

Natick formally began their EMS implementation in February 2002 and completed a “dress rehearsal” internal audit in December 2004. At the point of this first audit, and after approximately 22 months of actual implementation activities, the Division found that their EMS was approximately 85-90% in conformance with the ISO 14001 Standard.

During the case study interview, the EMR expressed that he thought his organization implemented the system relatively efficiently and that 18-24 months was about the correct timeframe for implementation of a viable and effective EMS. The general approach utilized by the Town was for the EMR to accept the bulk of responsibility for managing implementation activities, strategically involving and delegating the resources of team members throughout the implementation. The approach mainly resulted in the EMR working directly with the technical consultant in drafting procedures and plans, which were then presented to the full team for review, comment, and implementation.

The Oversight Committee and Core Team devoted the most significant portion of their time and efforts during key EMS implementation activities, including aspect/impact analysis, setting of objectives and targets, and the internal audit. The approach was

effective in that it relied upon the collective practical knowledge of the full EMS team at strategic times to ensure that Natick developed an EMS that was realistic, applicable, and results driven.

Natick planned and implemented their EMS in distinct phases:

| PHASE I |
|---|
| <ul style="list-style-type: none"> ▪ Appointment of a project manager to lead the effort ▪ Confirmation of top management support/buy-in ▪ Selection of an EMS Implementation Team ▪ Selection of an EMS Core Team ▪ Selection of an EMS Fenceline ▪ Development of an Environmental Management Policy for the EMS |
| PHASE II |
| <ul style="list-style-type: none"> ▪ Trained EMS Implementation Team (Environmental Aspects, Objectives and Targets) ▪ Identified Environmental Aspects/Impacts ▪ Developed criteria to evaluate Environmental Aspects/Impacts ▪ Selected Significant Environmental Aspects/Impacts ▪ Identified Legal and Other Requirements ▪ Developed a written standard for EMS Definitions ▪ Developed a written standard for Environmental Policy ▪ Developed a written standard to identify/evaluate Aspects/Impacts and select Significant Aspects/Impacts ▪ Developed a written standard to identify Legal and Other Requirements ▪ Developed a written standard for Objectives and Targets ▪ Developed a written standard for Environmental Management Program ▪ Developed a written standard for Structure and Responsibility |
| PHASE III |
| <ul style="list-style-type: none"> ▪ Completed Objectives and Targets ▪ Completed EMS Implementation and Operation Controls ▪ Drafted and completed EMS standards that meet the ISO 14001 Standard ▪ Conducted an Internal Audit |
| Phase IV |
| <ul style="list-style-type: none"> ▪ Completed Corrective Actions ▪ Conducted a Management Review ▪ Determine preparedness for third party verification audit |

OUTREACH

Natick has utilized the following main strategies to promote their environmental efforts and meet the ISO 14001 Standard:

- 1) **EMS Website:** Natick has posted background information on all EMS elements to the Town of Natick website. Under the Department of Public Works pages, the public can find descriptions of implementation approaches and activities, copies of the related environmental policies, a list of aspects and targets, and audit information. The webpages are consistently maintained and updated, providing a central source of EMS information for both internal and external purposes: http://natickma.virtualltownhall.net/Public_Documents/NatickMA_PubWorks/EMS
- 2) **Pollution Prevention Plan and Project Updates:** Due to the November 2001 U.S. EPA Consent Decree, the Town of Natick was required to complete a

Supplemental Environmental Project which included preparation of a Pollution Prevention Plan. As the Town has approached completion of the 3-year enforcement action they produced a Pollution Prevention Project Benefits compilation table to communicate their performance.

- 3) **Annual Environmental Compliance Report:** The Town has completed Annual Environmental Compliance Reports since 2002 providing the public with a status of compliance audits, pollution prevention projects, and related benefits to the Town. The latest Report, for 2004, is publicly available at http://natickma.virtualtownhall.net/Public_Documents/NatickMA_EnvComply/Annualreport2004.

RESOURCES REQUIRED TO IMPLEMENT/MAINTAIN THE EMS

One complete cycle of EMS implementation (policy to internal audit) required Natick to commit approximately 1,000 total direct labor hours, in addition to their regular duties, at a cost of approximately \$30,000 in direct labor costs and \$20,000 in consultant services. Bob Bois, the EMR, estimates that he logged a significant portion (~50-60%) of the overall direct labor working individually with a consultant to develop draft procedures and approaches, which were then reviewed and implemented by the Team. Overall, Mr. Bois estimated that he spent approximately 20% of his time on EMS implementation activities, with the remainder dedicated to other responsibilities as Town Compliance Officer and Conservation Agent.

3RD PARTY VERIFICATION

The Town of Natick is planning to seek third party ISO 14001 certification for its EMS upon completion of treatment plant upgrades. Based upon the results of their internal “dress rehearsal” audit conducted in December 2004, the Town is targeting late 2005 for the 3rd Party Verification Audit.

The Town believes that third party registration will provide an additional level of motivation and accountability. Once the organization obtains registration, no one will want to let it slip away especially under the watchful public eye. In addition, ISO registration will ensure the long-term vitality of the EMS giving the system a higher level of resilience through the organizational changes that invariably occur.

“The Town took a big public image hit with the U.S. EPA Consent Decree. When I initially highlighted the strengths of EMS as a sound approach, ISO 14001 certification really appealed to our Public Works Director. He replied that he had seen a number of companies waving their ISO flags and said he wanted Natick to do the same”.

Bob Bois
Environmental Compliance Officer and EMR

Based on the costs incurred by other local governments and initial estimates, Natick projects the registration process will cost approximately \$5,000 for the initial registration audit and surveillance audits for one-year.

BARRIERS/LESSONS LEARNED/KEYS TO SUCCESS

Due to a committed EMR serving as the EMS champion, participation in

the Municipal Stewardship Program, and the assistance of a knowledgeable and experienced consultant, Natick's EMS was implemented and institutionalized relatively efficiently, with only limited bumps in the road. The following are barriers, lessons learned, and keys to success as defined by Natick personnel:



Top 3 Keys to Success

1. External program participation – participating in the Municipal Stewardship Program was a motivator and allowed for technical assistance.
2. Proven templates – the ability to leverage practitioner tools allowed its team to translate concepts and programs into a usable structure.
3. Technical assistance – Our technical assistance consultant provided EMS implementation experience combined with water systems knowledge, which helped guide our team through trouble spots and bridge the knowledge gap among our team members to help them understand how EMS elements related to their actual daily activities.



Top 3 Barriers

1. Consistent meeting times – water operations are 24/7, thus it was difficult to bring together requisite team members and ensure effective communication.
2. EMS understanding – personnel had very limited upfront knowledge of the EMS process, thus significant amount of the work was handled by the EMR.
3. Development of plans – the creation of environmental management plans to clearly identify a path for meeting targets could have been more effective early on. This component was not given the original attention that it deserved.



Top 3 Lessons Learned

1. Remember that the basis of an EMS is continual improvement. The EMS should promote performance, but an organization must also be realistic about what it can reasonably achieve with each cycle.
2. It is unlikely that an organization can implement an EMS completely from scratch without relying upon outside examples and experiences. Developing one's own templates, techniques, strategies, without sourcing suggestions, concepts, experiences from other practitioners, would be significantly inefficient and potentially overly burdensome. Don't reinvent the wheel.
3. Stay away from "ISO-ese". Translate the EMS jargon so that the workforce can clearly understand it and apply it to their everyday activities.

NEXT STEPS

Natick will continue developing its EMS and advance its environmental targets. Currently, the Town is planning to seek third party certification for its EMS through ISO 14001 registration upon completion of treatment plant upgrades. The target timeframe is late 2005.

Looking towards the future, Natick has incorporated EMS expansion plans into their 5-year planning process for DPW that begins next year. The Town has considered expansion of their EMS to include other divisions within the Department of Public Works, including Vehicle Maintenance. However, the decision has been made to first complete necessary treatment plant upgrades, ensure that requisite adjustments are made under their EMS, and then seek third party certification for the EMS within the existing fenceline. After obtaining certification, the decision to expand their EMS will be re-visited.

ADDITIONAL INFORMATION

For additional information on Natick's EMS experience and progress, please contact:

Bob Bois
13 East Central St
Natick, MA 01760
508-647-6452
bbois@natickma.org

In addition, the Town of Natick maintains up-to-date webpages devoted solely to their EMS implementation:

http://natickma.virtualtownhall.net/Public_Documents/NatickMA_PubWorks/EMS

EMS CASE STUDY #3

CAMDEN COUNTY MUNICIPAL UTILITIES AUTHORITY Delaware No. 1 Water Pollution Control Facility

Organizational Profile/Background

Camden County is located in the southwestern portion of New Jersey, across the Delaware River from Philadelphia. The County is 226 square miles in area, with a population of about 500,000. There are thirty-seven municipalities in Camden County.

The Camden County Municipal Utilities Authority (CCUMA) treats 58 million gallons of sewage per day at two plants, the Delaware No. 1 Water Pollution Control Facility and the Winslow Water Pollution Control Facility. This flow travels through 90 miles of pipe assisted by 25 pump stations. Partnering with the Winslow, New Jersey Facility, operations help serve the County's population of 500,000 and City of Camden sanitary sewage and stormwater.

CCMUA was required to construct these facilities as a regional wastewater treatment system by the U.S. EPA to bring Camden County into compliance with the Federal Clean Water Act. Before this regional wastewater treatment system was constructed to replace aging and overburdened infrastructure, it was estimated that 45 million gallons per day of inadequately treated sewage was discharged into the lakes and streams of Camden County. CCMUA has 145 employees overall, including the treatment plant, sewer collection system, and administration.

EMS FENCELINE SELECTED

Camden County selected its Delaware No. 1 Water Pollution Control Facility (Delaware No. 1 WPCF) for its EMS "fenceline" and began implementation in February 2000. This facility is New Jersey's fourth-largest wastewater treatment plant with a design capacity of 80 million gallons per day, and a hydraulic capacity of 160 million gallons per day. The facility treats sanitary sewage from Camden County and the city of Camden, as well as stormwater from Camden City.

The plant incorporates primary and secondary treatment of wastewater prior to discharge to the Delaware River. Sludge thickening is accomplished using belt filter presses, which result in the generation of approximately 1,200 tons per week of sludge cake at 26-27% solids. Sludge is currently disposed of at incineration and composting facilities in Burlington and Gloucester Counties, but the CCMUA is currently in the process of installing new sludge drying facilities at the plant.

KEY REASONS FOR IMPLEMENTING AN EMS

Camden County decided upon an EMS as part of a commitment to control and optimize its water quality, odor control, and costs while meeting the needs of the environment, employees, ratepayers, and the local community. An EMS allowed the County to strategically and efficiently fulfill this commitment for the long-term and

identify opportunities for improvement. In the middle 1990's, CCMUA faced significant privatization pressure, punctuated by the first rate increase in nine years and an external study citing inefficiencies in maintenance and operation. In addition, CCMUA was sued by a citizens group and the New Jersey Department of Environmental Protection over odor complaints.

In response to the formal odor lawsuit and external pressures, CCMUA hired a consultant to assess operations and develop an operational plan to reduce odors at the plant and increase efficiency. To accomplish this, CCMUA entered into a formal Consent Decree to work directly with the New Jersey DEP, with an understanding that the formal lawsuit would be dropped. Based upon desired organizational and operational changes, CCMUA and the New Jersey DEP agreed that an EMS was the logical approach. CCMUA decided to implement an EMS in conformance with the U.S. EPA National Enforcement Investigations Center (NEIC) Compliance-focused EMS-Enforcement Agreement Guidance.

CCMUA examined the City of San Diego's Metropolitan Wastewater Department's positive experience with EMS in making their decision. San Diego's Operation and Maintenance Division achieved ISO 14001 certification in 2003. For additional information, please visit www.peercenter.net.

During the case study interview, Andy Kricun, the Deputy Executive Director and EMS Program Manager (see EMR Profile below) defined several drivers for why he championed the EMS approach for Camden County:

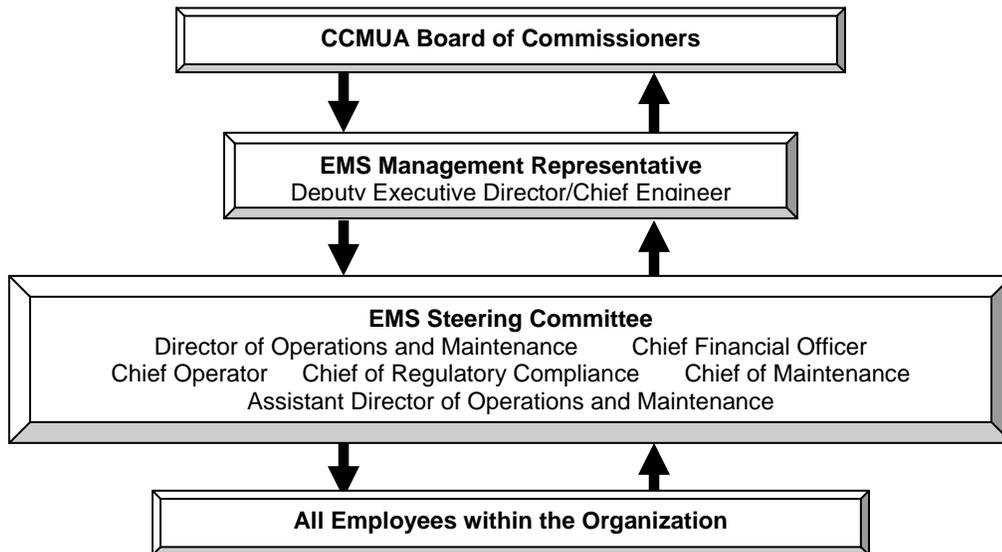
- An EMS provided a more systematic, proven approach;
- The EMS approach complemented then current activities and provided a “stamp of authenticity” for the Board;
- CCMUA was facing pressure to increase performance and reduce operational budget; and
- The Authority needed a means to proactively address community odor complaints.

EMS CORE TEAM STRUCTURE

Camden County's EMS Steering Committee is made up of 7 members, including select managers and employees. The EMS Steering Committee is led by the EMS Program Manager, who is also the Deputy Executive Director of CCMUA, and has the full support of the CCMUA Board of Commissioners. The Committee was purposefully heavy on the management side because significant organizational and operational change was required. Members were appointed by Top Management and the Board. The EMS Steering Committee assumed much of the responsibility and provided the internal catalyst for sustained EMS development activities.

Camden County selected Andrew Kricun, Deputy Executive Director and Chief Engineer, to lead the EMS implementation and serve as Environmental Management Representative (EMR). Mr. Kricun has twenty years of experience in environmental engineering and management. He graduated with honors from Princeton University with a degree in Chemical Engineering. Mr. Kricun is a licensed civil engineer and a member of the Water Environment Federation's EMS Committee.

The following EMS chart details the basic team structure:



ENVIRONMENTAL POLICY

Camden County chose to adopt an Environmental Policy as part of their initial EMS implementation efforts. The EMS Team and County representatives felt that passing this resolution was critical to ensuring the full support and commitment of the organization top-down, bottom-up.

CAMDEN COUNTY ENVIRONMENTAL POLICY STATEMENT

The mission of the Camden County Municipal Utilities Authority is to be committed to our customers, to the betterment of public health and to do our utmost to contribute to better air and water quality through the optimal operation of our wastewater treatment systems. The CCMUA will accomplish its mission through a proactive and determined commitment to:

- Continuous compliance with all applicable environmental regulations, standards and permits
- Continual optimization of wastewater treatment operations
- Continual optimization of odor control performance
- Communication of these goals to our employees, to our customers and our neighbors

Adopted by CCMUA Board of Commissioners and its members on June 19, 2000.

SIGNIFICANT ASPECTS & IMPACTS

Camden County followed the U.S. EPA Compliance-focused EMS (CFEMS) model and guidance to assess and prioritize operations and activities that have an environmental impact. The CFEMS guidance states that organizations implement a:

“process for identifying operations and waste streams where equipment malfunctions and deterioration, operator errors, and discharges or emissions may be causing, or may lead to: 1) releases of hazardous waste or other pollutants to the environment; 2) a threat to human health or the environment; or 3) violations of environmental requirements”.

“In the past, if anyone mentioned odor complaints the comments would have been dismissed with little attention. Since the EMS process and associated organizational changes, employees react much differently because they understand the importance of addressing community issues”.

- Andy Kricun, Deputy Executive Director, CCMUA

To accomplish this step, CCMUA hired the consultant Camp Dresser & McKee Inc. to conduct an assessment of operations and develop a list of inefficiencies and ineffective operations, as well as a plan for how to address each. CCMUA’s EMS Steering Committee discussed the list and ranked the items according to environmental, safety and health, community, and budgetary impact.

| EMS Areas of Focus |
|---|
| 1. Optimizing water quality |
| 2. Optimizing odor control performance |
| 3. Minimizing cost without sacrificing progress on the top two areas of focus |

EMS OBJECTIVES, TARGETS, AND PROGRAMS

Based upon the EMS Areas of Focus, CCMUA is working towards the following

environmental targets, with example programs and key activities:

- 1. Maintain suspended solids and Biological Oxygen Demand (BOD) below 20 ppm, with a target of below 15 ppm.**
 - Improvements to sludge thickening and dewatering capability in order to remove sludge efficiently. CCMUA believes that this action was the most important for improving water quality performance.
 - Improvements to primary and final sedimentation tanks.
 - Internal emphasis on performing beyond permit levels.

- 2. Complete elimination (100%) of offsite odors.**
 - Installed new chemical scrubber at plant headworks
 - Installed new biofilter at plant headworks
 - Installed new carbon filter for scum concentration
 - Initiated a Zero Tolerance Program for odor control

- 3. Maximal capture of we weather flow, without adversely impacting water quality.**

- 4. Increased cost savings**

BENEFITS OF ADOPTING AN EMS

Cost Savings

- 25% reduction in operations and maintenance costs (includes treatment plant and collection system) from \$21.2 million in 1996 to \$16 million in 2000.
- 6% lower rate than in 1996, with three separate rate reductions in 10 years. CCMUA has held its rate for 10 straight years and are on target to hold the rate for an eleventh in 2006.

Improved Compliance

- Regularly discharging effluent that ranges from 12-18ppm, having struggled in the late 1990's to meet 30 ppm limits on a consistent basis.

Increased Operational Consistency and Efficiency

- Reduction of wet weather bypasses from 24 in 1999 to 2 over the last 6 years.
- 25% increase in tonnage of sludge removed from the plant from 46,000 tons per year in 1999, to 55,000 tons in 2000, to 60,000 tons currently.

Enhanced Public Image

- 90% reduction in verified odor complaints from 16 in 1997-1998 to 2 in last 6 years. Initiated a Zero Tolerance Program for odor control to completely eliminate offsite odors.
- Implementation of New Jersey Department of Environmental Protection (NJDEP) approved community notification system that provides the neighboring community with 24-hour telephone access for reporting odor concerns. The hotline provides real time community input to CCMUA's EMS.

IMPLEMENTATION STRATEGY AND TIME FRAME

Camden County designed their EMS implementation, beginning in February 2000, based on the U.S. EPA National Enforcement Investigations Center (NEIC) Compliance-Focused Environmental Management System (CFEMS) Enforcement Agreement Guidance 12 Key Element approach. The CFEMS model is intended to supplement, not replace, EMS models developed by voluntary consensus standards bodies, such as ISO 14001. The model incorporates the standard "plan, do, check, and act" approach. The CFEMS model is based upon the following 12 Key Elements:

1. Environmental Policy
2. Organization, Personnel, and Oversight of EMS
3. Accountability and Responsibility
4. Environmental Requirements
5. Assessment, Prevention, and Control
6. Environmental Incident and Noncompliance Investigations
7. Environmental Training, Awareness, and Competence
8. Environmental Planning and Organizational Decision-Making
9. Maintenance of Records and Documentation

10. Pollution Prevention Program
11. Continuing Program Evaluation and Improvement
12. Public Involvement/Community Outreach

For additional information and guidance on the CFEMS model, please visit:
<http://www.epa.gov/compliance/resources/publications/incentives/ems/ems12elemr.pdf>

OUTREACH Camden County has utilized the following main strategies to promote their environmental efforts and meet the ISO 14001 Standard:

- 1) **EMS Website:** Camden County has posted background information on all EMS elements to the County’s website, including background information on how the team approached each implementation element. The webpages are consistently maintained and updated, providing a central source of information for both internal and external purposes: <http://www.ccmua.org/emstoc.html>.
- 2) **Quarterly Billing Insert:** Includes cost savings initiatives that directly impact rate payers and the local community, as well as information on water quality and related performance.
- 3) **Citizens Advisory Board:** The Board was originally developed in response to the odor issues and rate increase that occurred in the later 1990’s. Since both of these issues have since been adequately addressed and maintained, the Board is less active currently.

RESOURCES REQUIRED TO IMPLEMENT/MAINTAIN THE EMS CCMUA’s EMS goals correspond completely with the organization’s overall goals; therefore, it is nearly impossible to differentiate general operations and maintenance costs from direct labor resources for EMS. CCMUA views EMS as a means to improve progress towards meeting organizational goals, so the labor resources used for EMS are “sunk” costs (i.e., would expend these resources regardless), not a marginal cost. The EMS allows CCMUA to target resources more effectively, strategically, and with greater return on investment. Overall, CCMUA’s Deputy Executive Director estimates that he spends approximately 70% of his time on EMS-related issues.

3RD PARTY VERIFICATION Camden has conducted internal audits, but consciously made the decision as an organization that external verification and registration is not worth the time and monetary investment for their organization at this time.

BARRIERS/LESSONS LEARNED/KEYS TO SUCCESS



Keys to Success

1. It is critical to have defined plans with accountability for performance and ultimately results. At each meeting, it was important to formalize actions, responsibilities, and timelines for important activities. This allowed our team to stay focused and maintain progress towards achieving goals. Otherwise, it is very easy to bottleneck and let important actions slide, especially against competing responsibilities and projects.
2. Persistent follow-up to make sure plans are being implemented efficiently and effectively. Our teams discovered that one way to shorten meetings and gain recognition was to remove items from the “problem area” or “outstanding item” lists. This was especially true as responsibilities were defined and employees did not want to be held accountable for on-going issues.
3. Building off the above keys to success, it was important to “memorialize” meetings by producing and distributing notes. The result is a documented acknowledgement of responsibilities, which holds direct accountability for subsequent meeting follow-up. This kept the CCMUA team focused on progress and ensured that everyone was on the same page and understood expectations and milestones moving forward.



Top 3 Barriers

1. EMS was a relatively new and innovative approach, thus had to be sold throughout the organization. When CCMUA began EMS implementation, case studies and practical examples were limited since the ISO 14001 Standard was only a couple of years old. Comparatively, there is a wealth of information and “assurances” that the process can be utilized effectively within the wastewater sector.
2. Feeling that public sector organizations are limited and that there are no “carrots” for employee motivations and buy-in. This barrier is often encountered in public agencies as efficiencies do not always translate into budget allocations and employee incentives or rewards. There is a need to be creative in motivating teams and the organization, especially with a program of continual improvement.
3. Achieving a comfort level with the program whereby employees would feel their ideas are listened to. Many organizations encounter initial resistance with any new program or approach, as employees and stakeholders take a “holding pattern” position until they feel comfortable with how an initiative positively or negatively impacts their position. With EMS, jargon is also an initial barrier as most people don’t feel comfortable until they achieve a working understanding of an approach.



Top 3 Lessons Learned

1. Stay persistent and hold teams and/or team members accountable for defined responsibilities and action plans. As mentioned previously, make sure that tasks and action items are assigned leads and that there is accountability to ensure follow up.
2. Not the same drivers as in the private sector, thus need to adapt business case and consider rate payers. Often times organizations embrace an EMS or similar approach but do not give adequate time to capturing and communicating performance benefits.
3. Don't overlook the wealth of knowledge and experience internally within your organization. We realized after initial meetings that our internal personnel had years and years of technical experience and had a more thorough understanding of actual day-to-day operations than nearly anyone we could bring in externally. This provided a real "grounding" mechanism for any changes that our team considered.

NEXT STEPS

Camden County will continue to maintain their EMS and seek opportunities for continued improvement. Currently, the county is assessing the potential for either expanding their EMS to include the interceptor system following the U.S. EPA Capacity, Management, Operations, and Maintenance (CMOM) principles as they are specifically designed for this component of the system.

In addition, Camden County will look to document more of their efforts and resulting procedures to capture much of the institutional knowledge and experience gained. Often times this is an extremely valuable benefit of EMS as an approach, since many municipalities ultimately face significant turnover with retirement of key personnel and operators with years of experience. In Camden County's case, the Authority estimates that 80% of the workforce has at least 15 years of experience.

ADDITIONAL INFORMATION

For additional information on Camden County's EMS experience and progress, please contact:

Andrew Kricun
Deputy Executive Director
1645 Ferry Avenue
Camden, New Jersey 08101
(856) 541-3700, ext 1223
andy@ccmua.org

In addition, the Camden County maintains up-to-date webpages devoted solely to their EMS implementation <http://www.ccmua.org/emstoc.html>.

EMS CASE STUDY #4

OAKLAND COUNTY DRAIN COMMISSIONER'S OFFICE

Wastewater Treatment Complex – Waterford, Michigan

Organizational Profile/Background

The Oakland County Drain Commissioner's Office is charged with the responsibility of meeting Storm water regulations as a subset of the Federal Clean Water Act. Through this program, the Drain Office offers programs to address water pollution challenges through watershed-based planning, public education, and illicit discharge detection activities. There are 61 cities, villages and townships in Oakland County. Many of them look to the Drain Commissioner's Office to provide a myriad of services. When requested by local communities, it's the drain commissioner's job to serve as the facilitator for new construction projects whether they're drains, sewers, or a new water supply system. The Drain Office supplies project management for the planning, reviewing and financing through final construction.

The Oakland County Drain Commissioner's Office also operates and maintains municipal water and sewer systems, wastewater treatment plants along with retention and treatment facilities. This is all done at the request of various municipalities within the county. In addition, the Drain Office serves as a valuable information resource for water and sewer systems. Every task, from maintaining storm drains and sanitary sewer systems, to reading meters, inspecting fire hydrants, and repairing water main breaks, mandates that a highly trained staff, armed with specialized equipment, can do the job. Some tasks, such as fixing a break in a water main, require immediate attention. Oakland County residents expect a prompt response from employees who are on call 24 hours a day, seven days a week, regardless of the weather.

The Drain Office derives its broad powers and responsibilities via several state and federal laws. Its primary duties are described in a statewide law: the Michigan Drain Code, Act 40 of 1956, as amended. Additional powers and duties of the Drain Commissioner derive from the provisions of two Public Works Acts, Act 342 of 1939 and Act 185 of 1957; the Subdivision Control Act, Act 288 of 1967, as amended, the Environmental Protection Act, Act 451 of 1994, as amended, including Part 91, Soil Erosion and Sedimentation Control, Part 307, Inland Lake Levels, and Part 309, Inland Lake Improvements; and various other statutes.

The Oakland County Drain Commissioner's Office is committed to providing water quality through a superior system of storm water drainage and sewage disposal systems while offering the assurance of a quality drinking water supply system necessary to sustain and promote the county's growth potential. When it does that, it contributes to the high quality of life Oakland County residents have come to enjoy and expect.

NATIONAL PILOT PROJECT PARTICIPATION

The Oakland County Drain office decided to implement its EMS through the 3rd *EMS Initiative for Public Entities*, a U.S. EPA-supported national pilot

project facilitated by the Global Environment & Technology Foundation (www.getf.org). Since August 1997, 32 public entities have benefited from environmental management system (EMS) implementation thanks to their participation in three "EMS Initiatives for Local Government Entities" initiatives. The initiatives were made possible through a cooperative agreement between the U.S. Environmental Protection Agency (EPA) and the Global Environment & Technology Foundation (GETF). The initiatives tested the applicability and benefit of an EMS on environmental performance, pollution prevention, and stakeholder involvement in government operations. Participant organization have included ports, universities, utilities, wastewater treatment, and others further promoting EPA's overall policy to actively promote adoption of EMSs in key sectors. For more information on these initiatives please visit www.getf.org/projects/muni.cfm.

EMS FENCELINE SELECTED

The Oakland County Drain Office selected to implement the EMS across the entire organization from the very beginning, believing that the organization could leverage its ISO 9001 Quality Management System and integrate the EMS in a single "pass". The organization includes approximately 260 employees dispersed among 20 units. There are two central Divisions: Engineering & Construction and Operations & Maintenance. The EMS fenceline includes the following central activities and sites:

- ★ Project Management, Regulatory Review, Environmental Stewardship, Operations and Maintenance service for Storm Drains, Sewers, Water supply, Wastewater Treatment, and Administration.
- ★ Commerce Wastewater Treatment Plant, George W. Kuhn Retention Treatment Basin, Pump Maintenance Facility, Walled Lake/Novi Wastewater Treatment Plant and Water Maintenance Facility.

KEY REASONS FOR IMPLEMENTING AN EMS

The primary goals of the Oakland County Drain Commissioner's Office are to improve employee awareness of environmental issues while building a positive working relationship with federal and state agencies. While the Drain Commission has prided itself in being environmentally sensitive, it is convinced that adopting an EMS and recently becoming certified to the ISO 14001 has helped improve

OAKLAND COUNTY EMS ORGANIZATIONAL GOALS

- To improve employee awareness of environmental issues, responsibilities and to improve both internal and external communication to ensure that employees and customers are kept informed of environmentally sound practices already in place.
- To build positive working relationships with federal and state agencies to ensure that compliance issues are addressed quickly and forthrightly with an eye toward continual improvement.
- To preserve and protect the quality of the environment in areas where we have jurisdiction and to promote the preservation and protection of areas where we have no jurisdiction by promoting education and awareness of sound environmental practices.
- To implement Best Management Practices throughout the organization to improve efficiency and implement cost savings where practical.
- To improve employee morale and, by extension, improve our public image through improved communication and cooperation with outside agencies and the public to increase awareness of our jurisdictional limitations.
- To continue to conform with ISO 14001 standards.

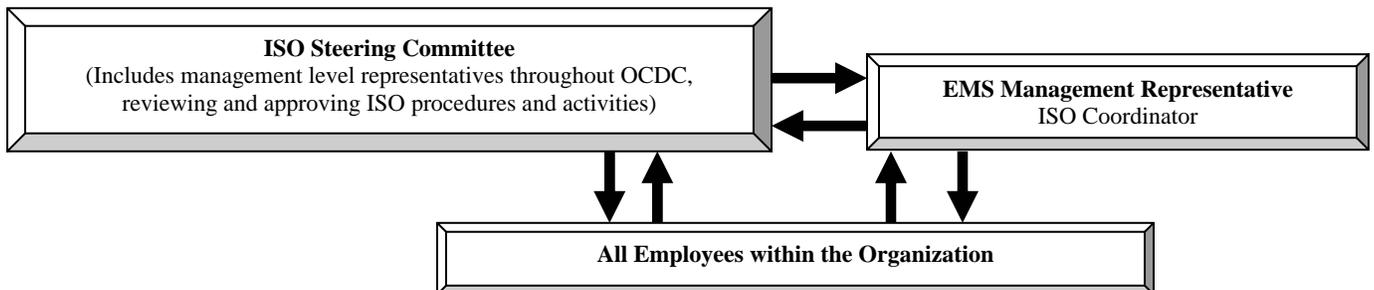
on past success in the environmental arena while, at the same time, making a positive impact on helping customers.

EMS CORE TEAM STRUCTURE

The EMS core team is made up of five members, with the ISO Coordinator designated as the EMS Project Manager or “Environmental Management Representative”. The initial EMS Core Team was selected based upon their role as the ISO 9001 Steering Committee members and working knowledge of management systems approach. Top management is actively involved in all core team activities.

Oakland County selected Sherri Gee, ISO Coordinator, to lead the EMS implementation. Ms. Gee joined OCDC in January 2002 to assist the organization in implementing the ISO 9001 management system. Ms. Gee has previous experience implementing an ISO 14001 management system in the automotive industry.

The following EMS chart details the basic team structure:



ENVIRONMENTAL POLICY

The Oakland County Drain Commissioner’s Office had a Quality Policy in place when it initiated the Environmental Management program. To avoid confusion and provide for true integration, the OCDC used the existing Quality policy and added a few key elements to

QUALITY POLICY

We are committed to excellence and providing progressive solutions by utilizing quality objectives and sound environmental practices. Our organization has pledged a commitment to maintain management practices that ensure continuous improvement and the prevention of pollution. We will set goals that encourage efforts to meet or exceed local, state and federal water quality standards and environmental requirements within our control.

MISSION STATEMENT

The Oakland County Drain Commissioner’s Office is dedicated to the principles of integrity and professionalism, and to the preservation and protection of public health, welfare, convenience and the citizens’ right to quality water.

We are committed to providing our customers with services of high value, that are fairly priced and environmentally sound.

In our quest for excellence it is imperative that each member of our staff reacts to the problems of the public promptly, with sensitivity and respect. In addition, we will endeavor to provide an appropriate resource when a problem is not within our authority.

It is our desire to instill a culture that perpetuates an environment promoting trust, respect and teamwork.

8/20/03

fit its environmental objectives and to harmonize with the existing Mission Statement. Additions to the original policy include a commitment to continuous improvement and pollution prevention.

SIGNIFICANT ASPECTS & IMPACTS

The Environmental Aspect and Impact element of EMS implementation is the step where organization's assesses the operations, services, and activities within its EMS fenceline and identify how each positively and/or negatively affects the environment. The result is most commonly a list of environmental aspects (how an organization interacts with the environment – air emissions) and impacts (actual impact on the environment – degradation of air quality) that helps an organization visualize its “environmental footprint” and focus in on the most significant impacts. OCDC utilized a systematic approach to identifying its significant aspects and impacts, which included shared responsibility. The OCDC took the following steps in the aspect identification process:

1. Each Unit Supervisor was tasked to identify activities that occurred under his/her direction. In doing so, each manager was asked to fill out an Input/Output diagram (see Appendix A) for each central activity. This approach allowed for easy identification of impacts, waste, and byproducts. Unit Supervisors used operations personnel to assist in preparation of the I/O charts because they are the people that conduct activities and know them “in and out”.
2. The ISO Steering Committee identified the following criteria to determine significance:
 - Regulated
 - Concerns Interested Parties
 - Human Health & Safety
 - Natural Resources
 - Water Quality
3. The significance criteria were rated by each Unit Supervisor and their operators as follows and documented on an Environmental Impact Form (see Appendix B):

Severity (0=none, 1=low, 3=medium, 5=high)

Occurrence (0=no impact, 1=seldom, 3=occasionally, 5=often)

Detection (0=n/a, 1=Excellent controls in place, 3=some controls in place, 5=no controls in place)

(Severity + Occurrence) x Detection = Total

4. Information from the Input/Output Diagrams and Environmental Impact Form are entered into a database maintained by the ISO Coordinator.
5. Adding the individual scores resulted in a single total score for each activity. For example:

| Unit | Activity | Regulated | Interested Parties | HH & Safety | Nat'l Resources | Water Quality | Total |
|-------------|------------------|-----------|--------------------|-------------|-----------------|---------------|-------|
| Maintenance | Water Main Break | 6 | 10 | 50 | 50 | 25 | 141 |

6. The ISO Steering Committee reviewed the final rankings and determined significance as:
- Activities within the top three highest scores.
 - Activities affected by any new regulations.
7. Based upon the total scores, following are OCDC's initial significant aspects:

| Environmental Aspects |
|-----------------------------------|
| Sewer System Overflows |
| Septage Unloading Facilities |
| Maintaining and Installing Meters |
| Soil Erosion |

EMS OBJECTIVES, TARGETS, AND PROGRAMS

Based upon the identification of significant environmental aspects, OCDC developed the

following Objectives, Targets, and Programs to promote and measure environmental performance taking into account:

- ★ Significant Aspects
- ★ Legal and other requirements
- ★ Best available technology
- ★ Business requirements
- ★ Cost
- ★ Interested parties
- ★ Employee health and safety

Objective: Reduce high dosage chlorine flushed into waters of the states from OCDC operation and maintenance activities.

Performance Indicator: Concentration of chlorine in discharge.

| Target | Program(s) |
|---|--|
| By developing new standards by June 2005 and by revising OCDC chlorination procedures for disinfection. | <ol style="list-style-type: none"> 1) Collect and analyze chlorine residual data from OCDC O&M activities. 2) Research current and potential new methods for disinfecting water systems. 3) Review existing O&M standards, regulations and procedures 4) Recommend new O&M standards and procedures. 5) Change current OCDC O&M standards and procedures. |

Objective: Reduce the amount of paper used and increase the percentage of cardboard and batteries recycled.

Performance Indicator: Amount of paper purchased and average weight of batteries and cardboard recycled.

| Target | Program |
|------------------------------|---|
| 50 percent within two years. | 1) Identify baselines for each item (paper, cardboard, batteries) 2) Review current paper recycling process. 3) Implement two-sided copying standard 4) Implement battery and cardboard recycling at all locations 5) Educate employees to gain involvement |

Objective: Reduce potential for unnecessary inflow and infiltration in the Clinton/Oakland interceptor system.

Performance Indicator: Number of sub-standard manholes repaired vs. total number of sub-standard manholes.

| Target | Program |
|--|---|
| Repair all sub-standard manholes by December 2005. | 1) Effect and complete a manhole inspection program for the entire Clinton-Oakland Sewer Delivery System 2) Prepare a report that identifies the scope of work. 3) Conduct repairs based upon the inspections. 4) Prepare a final report that indicates the completion of the project. |

Objective: Reduce potential for sewer system overflows and unnecessary inflow and infiltration in the Evergreen-Farmington Sewage Disposal System.

Performance Indicator: Number of sub-standard manholes repaired vs. total number of sub-standard manholes.

| Target | Program |
|---|---|
| Rehabilitate all sub-standard floodprone manholes by December 2005. | 1) Prepare a report that identifies the scope of work. 2) Conduct repairs based upon the scope of work. 3) Prepare a final report that indicates the completion of the project. |

BENEFITS OF ADOPTING AN EMS

Enhanced Public Image

It is important for the public to understand that both their tax dollars and the money they pay in rates for water and wastewater services are being well spent. In addition to

observing sound business practices, the public is better served if those practices are incorporated with a proactive program to protect and preserve our precious natural resources. By embracing the tenants of EMS, we have been able to protect what we have, restore what we've lost and share what we've gained.

Sanitary Sewer Overflow Reduction

An important part of our daily responsibilities is the reduction of inflow and infiltration. By constructing a major addition to a combined sewer overflow basin in Madison Heights we have satisfactorily addressed residential concerns. The capacity of the basin was increased from 60 million gallons to 90 million gallons at a cost of some \$140 million dollars. Not only does this represent a significant financial commitment, it shows that our commitment to environmental protection goes far beyond mere hype.

Employee Awareness

We are proud of the fact that OCDC employees display an uncompromising dedication to their work. They are hard-working and conscientiously serve the residents of Oakland County. They are our ambassadors in the field and are the ones who meet with our customers face-to-face on a daily basis. Their enthusiastic support of EMS has helped make their jobs easier and has increased their awareness of how their actions, and the actions of those they serve, impact the environment.

Streamlined Processes

Many of OCDC's processes were documented as a result of ISO 9001 implementation. The introduction of EMS identified some areas where original documentation was not coordinated between individual units. For example, OCDC had four work instructions for reporting and responding to sewer system overflows. Identifying this through our EMS allowed us to combine the work instructions into one procedure that clarified responsibilities for all involved throughout the organization.

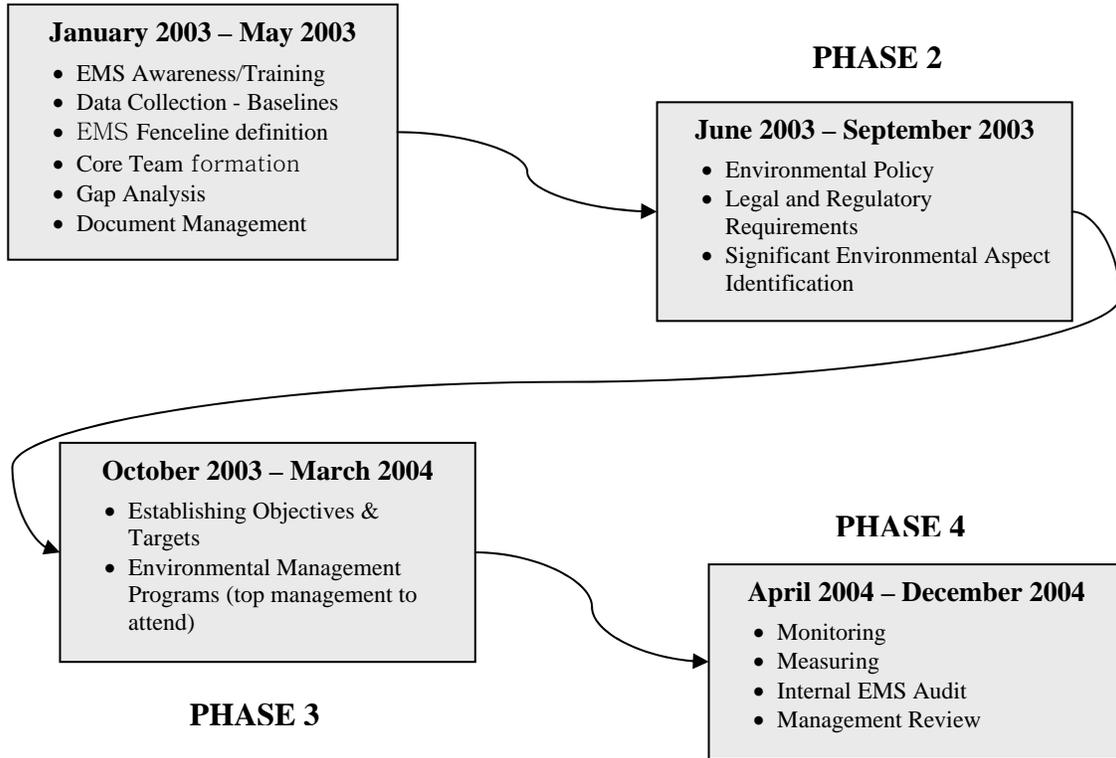
IMPLEMENTATION STRATEGY AND TIME FRAME

As a participant in the 3rd EMS Initiative for Public Entities, OCDC followed a

structured approach to EMS implementation. The basic approach was broken down into four distinct phases, with each phase requiring completion of detailed tasks and documentation over a 24-month period. The OCDC started implementation in January 2003 and completed its initial internal audit and management review in late December 2004. Oakland County's EMS was third-party verified in April 2005.

The following outlines the general EMS implementation process:

PHASE 1



RESOURCES REQUIRED TO IMPLEMENT/MAINTAIN THE EMS

Internal Labor -- One complete cycle of EMS implementation, over a 24-month period, required Oakland County to commit 2,646 total direct labor hours at a cost of approximately \$130,559. This number represents the direct labor hours employees performed in addition to their regular duties.

ISO Registrations and Audits – The Oakland County Drain Commissioner's Office received ISO 14001 registration in April 2005. The costs associated with the initial ISO 14001 external audit were approximately \$8,000. The on-going registration maintenance and surveillance audits cost is expected to be \$6,000 per year and will include both the ISO 14001 and ISO 9001 portions of the management system. OCDC will combine future external audits to cover both the quality and environmental portions of the management system at the same time. As a result, actual external audit fees may change.

THIRD PARTY VERIFICATION

OCDC verified its ISO 9001 management system through 3rd party registration in the fall of 2002. The external auditor assigned to OCDC for the initial registration was also qualified for ISO 14001 registration audits. Even though OCDC registered to the ISO 9001 management system first, it had always intended on implementing the environmental

component (ISO 14001) in the future. Therefore, the registration company, NSF-ISR, was originally chosen due to its experience in environmental fields.

“Third party verification confirms to the staff at OCDC as well as stakeholders and other county departments that our management system is in place and functioning as intended. Verification through an outside source gives credibility to our effort.”

Sherri Gee
ISO Coordinator

OCDC’s experience with registering to ISO 14001 proved to be a far less bumpy road than for many new registrants. That can be attributed to the fact that many of our staff members already were familiar with the ISO registration process. They had experienced it previously in becoming certified to the ISO 9000 standard. As a result, much of the ISO jargon and the fundamental principles were seamlessly incorporated into the newly adopted environmental standard. In other words, staff members came with first-hand experience with external audits and were, as a result, far less intimidated by the process. There was, however, a bit of a struggle as the external auditor navigated between unique OCDC organizational terms and ISO jargon. Fortunately, our ISO Coordinator, Sherri Gee, was able to serve as a competent guide to keep the procedure on course. Further, utilizing the same registration company and the same auditor for both the ISO 9001 registration process and the ISO 14000 registration proved helpful because the external auditor was already knowledgeable about OCDC’s organizational mandates and general business purpose and direction.

KEYS TO SUCCESS/BARRIERS/LESSONS LEARNED



Top Three Keys to Success

1. Taking the time to visit each of the facilities, meet with management and employees, and discuss the initial goals and objectives. This was effective in showing support and keeping everyone updated.
2. Effective communication. It is worth the time and effort to ensure that everyone has a consistent understanding of the system. This involved levels of employees.
3. Top management involvement in setting goals and defining environmental management programs.



Top Three Barriers

1. Selling the benefits of environmental responsibility to municipal customers.

2. Initial confusion associated with integrating management systems and initiatives. Many employees viewed early efforts as three separate initiatives (ISO 9001, ISO 14001, and EMS).
3. Managing resources was difficult because many employees faced “competing” responsibilities in addition to ISO implementation.



Top Three Lessons Learned

1. Communicate early and often across all lines of the organization. Avoid early confusion.
2. Translate EMS terms into organization terms as much as possible, especially in the beginning.
3. Keep all employees involved throughout the goal setting process to ensure uniformity.

NEXT STEPS

OCDC will continue to build upon its EMS experience with a particular emphasis on periodically reviewing its environmental goals. As technological advances become available, our staff will perform an appropriate evaluation to determine if they are appropriate to adopt and incorporate into our business practices. We are proud of the fact that this is an area where we have excelled. In fact, our office was able to convince both federal and state regulators that we could employ cost-saving measures in a more environmentally friendly manner to address a huge overflow challenge. The savings amount to more than \$160 million and was cited as an international model for other communities.

OCDC's novel solution to a costly construction project that serves 15 communities earned Drain Commissioner John P. McCulloch an invitation to participate in the American Public Works Association's International Congress.

Said McCulloch, “We significantly reduced the costs by using existing system capacity while at the same time implementing new measures to reduce inflow and infiltration into the system. It's something we can be proud of. We knew we had a winner, now it has been acknowledged in an international forum.

In that same spirit, OCDC encourages all employees to continually evaluate current practices with an eye toward improvement. Although most won't result in multi-million dollar savings, even the smallest improvement, when taken collectively with many others, amounts to a significant contribution and results in greater environmental protection.

ADDITIONAL INFORMATION

For additional information on Oakland County's EMS experience and progress, please contact:

Sherri Gee, ISO Coordinator
One Public Works Drive
Waterford, MI 48328
248-858-0108
gees@co.oakland.mi.us

EMS CASE STUDY #5

THE CITY OF LOWELL, MASSACHUSETTS ***Regional Wastewater Utility***

The City of Lowell is located in northeastern Massachusetts 12 miles from the Route 128 Beltway “America’s Technology Highway.” Less than two miles from the New Hampshire border and 25 miles from Boston, the City finds itself well-positioned in the center of the leading manufacturing region in Massachusetts. Manufacturing represents 32% of the jobs in the area with the majority found in the fields of plastics, high technology and medical technology. Based on the 1990 Census, Lowell has a population of 103,440 and occupies a land area of 13.4 square miles.

Lowell was incorporated as a township in 1826 and was later incorporated as a city in 1836. The City is governed by a nine-member elected City Council and a City Manager who is appointed by the Council. The Mayor is elected by the members of the City Council and serves as its presiding officer.

NATIONAL PILOT PROJECT PARTICIPATION

The Lowell Wastewater Facility decided to implement their EMS through the 1st *EMS Initiative for Local Governments 1997-1999*, a U.S. EPA supported national program facilitated by the Global Environment & Technology Foundation (www.getf.org). Since August 1997, 32 public entities have benefited from EMS implementation thanks to their participation in three *EMS Initiatives for Local Government Entities*. The initiatives were made possible through a cooperative agreement between the U.S. Environmental Protection Agency (EPA) and the Global Environment & Technology Foundation (GETF). The initiatives tested the applicability and benefit of an EMS on environmental performance, pollution prevention, and stakeholder involvement in government operations. Participant organization’s have included ports, universities, electric utilities, wastewater treatment plants, and others further promoting EPA’s overall policy to actively promote adoption of EMSs in key sectors. For more information on these initiatives please visit www.getf.org/projects/muni.cfm.

EMS FENCELINE SELECTED

The Lowell Regional Wastewater Utility was selected by the city as the EMS Fenceline. It was chosen because of the environmental nature of its primary mission and the Department’s progressive approach in searching out new methods to improve its operations. The Utility is an activated sludge wastewater treatment facility with a design flow of 32 million gallons a day (mgd) and an average flow of 30 mgd. In 1998, the facility produced approximately 23,540 wet tons of quality biosolid for land application or composting.

The facility provides primary and secondary treatment to more than 180,000 users located in five communities, Lowell included. The system includes 230 miles of sewer

lines, 5000 catch basins, and the same number of manholes. The facility is staffed with 46 employees.

KEY REASONS FOR IMPLEMENTING AN EMS

The Lowell Regional Wastewater Utility decided to participate in the national U.S. EPA supported EMS initiative because the facility had struggled with ongoing compliance issues, including a U.S. EPA Consent Order, and local community complaints concerning odors. In addition, the utility yearned to become an environmental leader within the region and saw EMS as the perfect opportunity to meet internal and external objectives.

LOWELL EMS IMPLEMENTATION DRIVERS

- Enhance City's overall image;
- Improve its environmental performance;
- Help lead the region's public sector toward compliance with the ISO standards through education, training and awareness; and,
- Maximize efficiency, reduce costs and avoid costly environmental emergencies thereby saving taxpayers money.
- Be a model of municipal operation that is competitive, and even outperforms, private sector operations.

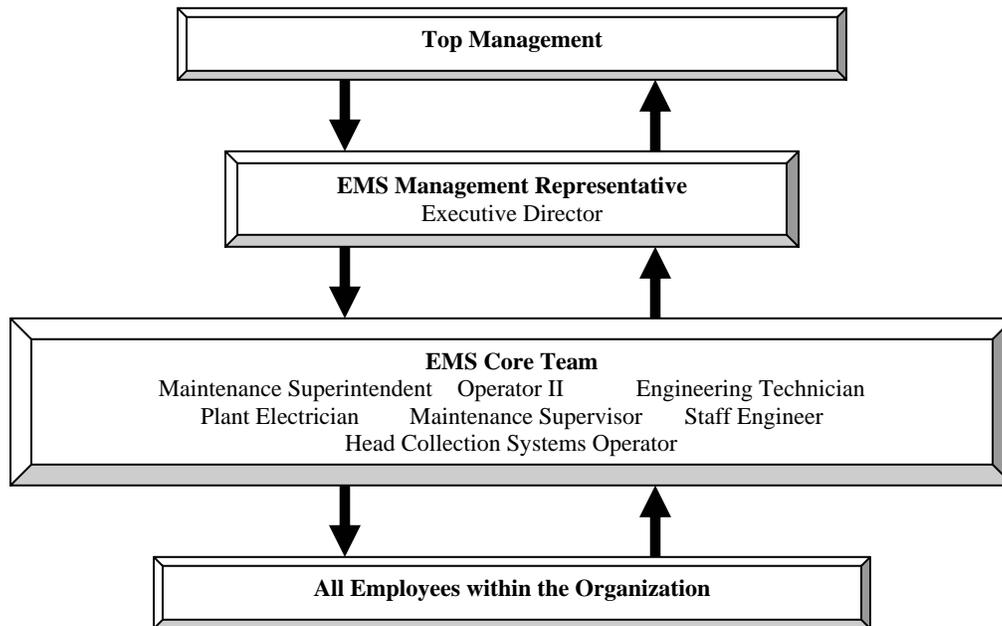
EMS CORE TEAM STRUCTURE

Lowell initially recruited personnel for their EMS Core Team by placing "teaser" posters about EMS in order to promote curiosity and interest.

This also served as a valuable awareness building tool within the organization. Based upon responses and discussions, a volunteer Core Team of 14 members was developed with representatives of each division, including Operations, Maintenance, Engineering/Pretreatment, Laboratory, and Administration (see organizational chart on following page). The Core Team stuck to a bi-weekly meeting structure during implementation, and as the EMS has matured the team meets at key intervals (i.e., aspects review, audits, compliance assessments). Recently the team has met more often as they are updating their System to meet the new ISO 14001:2004 Standard. The Core Team includes the Executive Director, whom also serves as top management for the EMS efforts. Since the Executive Director is also the organization's original "EMS champion", the team is able to work autonomously in developing and working towards EMS goals.

Mark Young has over 26 years experience in the wastewater field as an Operator, Head Operator, Operations Superintendent and Executive Director. He holds a Grade 7 Massachusetts Operator Municipal and Industrial Wastewater License as well as a Grade 4 Wastewater Collection Systems License. Mr. Young is also a board member and one of the founders of NEBRA (New England Biosolids and Residuals Association), an organization of wastewater professionals that promote beneficial reuse of biosolids in New England.

The following EMS chart details the basic EMS team structure, which currently includes seven Core Team members with only one Core Team member in a management position:



ENVIRONMENTAL POLICY The Lowell Regional Wastewater Utility is committed to maintaining a clean, healthy Merrimack River by providing reliable wastewater treatment and collection service in an environmentally sensitive and responsible manner. To accomplish this, the utility is committed to continually improving and reassessing the EMS, which benefits the citizens and employees by contributing to the improvement of water resources and environmental health of the community. The utility developed the following policy to communicate this commitment:

- EMS C.I.R.C.L.E**
- C. Communication**
 - I. Improve continuously on our policy**
 - R. Reduce, reuse, and recycle, to prevent pollution**
 - C. Comply with environmental laws and regulations**
 - L. Long term commitment to a clean and healthy environment**
 - E. Educate the community**

SIGNIFICANT ASPECTS & IMPACTS The environmental aspect and impact element of EMS implementation is the step where organization’s asses the operations, services, and activities within their EMS fenceline and identify how each positively and negatively affects the environment. The result is most commonly a list of environmental aspects (how you interact with the environment) and impacts (actual impact on the environment) that helps an organization visualize their “environmental footprint” and focus in on the most significant impacts.

Lowell utilized a systematic approach to identifying their significant aspects and impacts, which included shared responsibility among each member of the ISO Team. The city took the following steps in the aspect identification process:

1. Each division's ISO Team Member was tasked to assign personnel to identify all activities that occurred under the division's direction. The teams utilized a process flow diagram approach to identify aspects and impacts of individual activities and operations.
2. The ISO Team, as a group, consolidated the individual division inputs into a single list of environmental aspects and impacts to determine which aspects were significant. To accomplish this step, Lowell scored each aspect against the following significance criteria:
 - Worker health and safety
 - Public health and safety
 - Severity of environment
 - Probability of occurrence
 - Regulatory/Legal concerns
 - Public image

The ISO Team utilized a 0-4 scoring system with the following general classification system (0 = not applicable, 1 = low, 2 = moderate, 3 = high, and 4 = very high).

3. Based upon the initial analysis in 1998, Lowell determined that their major environmental impacts occurred in the following key areas:
 - Landfill/waste management;
 - Chemical management;
 - Odors;
 - Energy usage; and,
 - Industrial effluent

EMS OBJECTIVES, TARGETS, AND PROGRAMS

Based upon the identification of significant environmental aspects, Lowell established an

EMS Master Index that lists objectives, targets, programs, procedures, monitoring and measurement techniques, and responsibility for each significant aspect. Each Master List builds upon the previous year's targets and results, with the most recent as follows:

Objective: Reduce Impact on Wastestream

| Target(s) | Program(s) |
|--|---|
| 1. Increase waste recycled by 5% by 12/31/05 2. Maintain program aimed at increasing public awareness in 2005 3. Eliminate sludge disposal to landfill | <ul style="list-style-type: none"> ▪ Recycling programs. ▪ Catch Basin P2 ID Program; Utility & Citizen Used Oil Recycling Program. ▪ 10-year sludge utilization contract. |

Objective: Energy Conservation

| Target(s) | Program(s) |
|--|---|
| 1. Continue to reduce Kw usage by 12/31/05 | <ul style="list-style-type: none"> ▪ Energy Incentive Program is all-encompassing at the Lowell Utility. |

Objective: Improve Chemical Management

| Target(s) | Program(s) |
|---|--|
| <ol style="list-style-type: none"> 1. Achieve zero spills in 2005. 2. Continue to quantify state regulated waste disposed by end of 2005. | <ul style="list-style-type: none"> ▪ Maintenance Division Program. ▪ Bulk Chemical Deliveries. |

Objective: Odor Reduction

| Target(s) | Program(s) |
|--|--|
| 1. Not to exceed previous year's odor complaints | <ul style="list-style-type: none"> ▪ Odor complaint logs. ▪ Odor reduction procedures. |

Objective: Industrial Effluent

| Target(s) | Program(s) |
|--|--|
| 2. Establish inter-departmental new business awareness program | <ul style="list-style-type: none"> ▪ Currently on hold. |

BENEFITS OF ADOPTING AN EMS

Lowell has experienced a number of direct benefits from EMS implementation through increased focus upon their significant environmental and community impacts. In 2000, the Lowell Regional Wastewater Utility became the first municipal facility in the U.S. to certify all of its divisions to the ISO 14001 Standard. In accomplishing this tremendous feat and positioning Lowell as a municipal leader, the Utility achieved several "low hanging fruit" benefits that are common to EMS implementation. In the first few years, Lowell was able to completely offset the costs of EMS implementation through the identification of several cost saving measures, including:

- \$11,228 saved in the first three years by recycling waste paper and cardboard, co-mingled wastes, batteries, metals, fluorescent lights, and used motor oil.
- \$46,335 saved per year by replacing nine large energy inefficient pumps.
- \$126,450 in rebates from Mass Electric for further energy reducing projects.

Lowell has maintained their high level of commitment to continual improvements, as the EMS has matured to become a routine part of everyone's daily activities and performance. In 2004, the utility realized the following performance results:

| Significant Impact | 2004 Results |
|------------------------------------|---|
| Landfill Waste Management | Total lbs recycled 2001 = 59,077 |
| | Total lbs recycled 2002 = 76,400 |
| | Total lbs recycled 2003 = 37,850 |
| | Total lbs recycled 2004 = 46,893 |
| | |
| | Total gallons utility used oil in 2004 = 110 |
| | Total gallons citizen used oil in 2004 = 140 |
| | Total linear feet fluorescent bulbs in 2004 = 1,520 |
| | |
| Energy Usage | Kw usage 2001 = 7,128,800 |
| | Kw usage 2002 = 7,109,200 |
| | Kw usage 2003 = 6,770,400 |
| | Kw usage 2004 = 7,282,800 |
| | |
| Chemical Management and Use | No reportable chemical spills in 2004 |
| Odor | Odor complaints in 2001 = 17 |
| | Odor complaints in 2002 = 18 |
| | Odor complaints in 2003 = 24 |
| | Odor complaints in 2004 = 12 |

The utility has also experienced a number of qualitative, but equally important in their organization, benefits such as establishing a working relationship with the state regulatory agency and capturing internal knowledge and experience for future use.

IMPLEMENTATION STRATEGY AND TIME FRAME

As a participant in the 1st EMS Initiative for Local

Governments, Lowell followed a structured approach to EMS implementation. The basic approach was broken down into 4 distinct faces, with each phase requiring completion of detailed tasks and documentation, over a 24 month period. The City started implementation in August 1997 and completed their initial internal audit and management review in July 1999. Lowell relied upon the external assistance of Gabe Crognale, President of MCG & Associates, to assist with EMS implementation.

PHASE 1

August 1997 – January 1998

- Establishing the program infrastructure within the organization
 - EMS fenceline and Plan
 - Gap analysis
 - Roles and responsibilities
 - EMS “kickoff” activities
 - Environmental Policy

PHASE 2

February 1998 – June 1998

- Significant Aspect analysis and determination
- Setting objectives and targets
- Evaluating legal requirements

July 1998 – January 1999

- Developing Environmental Management Programs to achieve objectives and targets
- Roles, responsibilities, and authorities
- Operational controls

PHASE 3

February 1999 – July 1999

- Monitoring and measurement
- Internal EMS Audit
- Handling non-conformances
- Management Review

PHASE 4

The utility conducts an internal EMS audit, conducted by the seven Core Team members, on an annual basis. Each audit covers the entire EMS fence line and generally requires two employees and one external consultant over a one-two day time period. Recently, the utility has realized that they will need to be creative in recruiting new volunteers and building a larger auditing pool, as it is always healthy to have fresh eyes to keep a System continuously moving forward. This will also reduce the burden on Core Team members. One option also under consideration is to partner with other EMS practitioners in the local area for cross auditing.

OUTREACH

Lowell has utilized the following main strategies to promote their environmental efforts and meet the ISO 14001 Standard:

- 1) **Published Articles:** There have been several articles published highlighting Lowell's EMS accomplishments and ISO 14001 certification.
- 2) **Environmental Commitment/Policy Cards:** Lowell produced wallet-sized, laminated cards which include the City's ISO 14001 logo on one side and a copy of Lowell's environmental commitment and EMS C.I.R.C.L.E. on the reverse.
- 3) **City Website:** Lowell is in the process of updating the City's website to include detailed information about the Utility's EMS and associated activities and performance.

RESOURCES REQUIRED TO IMPLEMENT/MAINTAIN THE EMS

Internal Labor -- One complete EMS cycle (24 months) required 1,424 total person hours at a total cost of approximately \$27,100 in direct labor resources and \$10,500 in consultant costs. This number represents the direct labor hours employees performed in addition to their regular duties

ISO Registrations and Audits – The Lowell Wastewater Utility spent approximately \$5,000 on the initial ISO 14001 third-party certification audit. Lowell hired TUV to conduct the certification audit and has continued this relationship currently. TUV conducts yearly surveillance audits and three-year re-certification audits. The cost for surveillance audits is approximately \$2,300. In addition, the City Manager has offered a cash incentive to employees to maintain the certification.

Other Material Costs – The Lowell Wastewater Utility spent approximately \$4,800 in other travel and material costs during the initial EMS implementation. Travel costs included participation in training workshops as part of the national 1st EMS Initiative for Public Entities program.

3RD PARTY VERIFICATION

In 2000, the Lowell Wastewater Utility became the first public entity in the U.S. to certify all of its divisions to the ISO 14001 Standard. The decision was made by the entire team to seek certification, as they all felt that after putting so much effort into the EMS that they should seek external verification and credit. The city has maintained certification since

2000, instituting an incentive program whereby employees are given financial rewards from the City Manager for successful third-party audits and maintaining certification. Lowell has utilized the auditing services of TUV since the initial audit in 2000, feeling that it has been valuable to the organization, and the health of Lowell's EMS specifically, to maintain this long-term relationship. Prior to the initial third party audit, the utility found it very helpful to conduct an EMS awareness refreshment training for all employees to instill confidence and preparedness internally.

BARRIERS/LESSONS LEARNED/KEYS TO SUCCESS

The Lowell Regional Wastewater Utility's EMS implementation was very much a pioneering effort among public entities. Having started initial implementation in August 1997, the ISO 14001 Standard was less than a year old, with most organizations and technical assistance providers simply working through the interpretation with only limited practical experiences to learn from and exchange.



Top 3 Keys to Success

1. Hard working and dedicated staff. If it wasn't for the committed staff and their high skill level and understanding of the EMS concept, implementing it and making it happen, Lowell would not be where they are today. It was important to the success of the program that everyone was actively involved, included, and participating. The Implementation Team was enthusiastic at weekly meetings and most importantly inquisitive. This resulted in quality exchanges, suggestions, and potential improvement opportunities. A good approach is to always mention EMS, even if only briefly, at all organizational meetings.
2. Supportive and committed upper management and city officials. Once support was obtained from the City Manager, the City Council and other elected officials it made it possible for the Department Head and the staff at the Wastewater Utility to move ahead with EMS implementation and associated projects and programs.
3. Another key to success was our decision to hire a consultant (Gabe Crognale, President of MCG & Associates) to assist with document control and the development of the EMS manual. These two areas were a weakness for the Lowell team and the consultant was able to fill this gap and help prepare the Utility for ISO 14001 certification.



Top 3 Barriers

1. Time and monetary resources. There is a tremendous amount of time involved in training and implementation. Educating employees about the ISO 14001

concept can be time consuming as well. Resources were also spent on consultants and ISO 14001 certification. In-kind contributions by members of the community were also significant.

2. Turnover in staff – the EMS Core Team suffered a loss in key staff involved in the documentation process, which ultimately cost a significant amount of time developing the EMS.
3. Show of support and buy-in from the community – there was some support from the City Council and the local media channels but support was lacking from the general community. Councilor support was demonstrated by funding the ISO trips and presentations. Local media provided positive stories about the project. However, Lowell did not see a strong excitement or interest level in the community concerning the EMS efforts and related programs.



Top 3 Lessons Learned

1. Bring on a consultant early on – it would have been helpful to have a consultant on board during the early stages of implementation to assist with the training of the Core Members and members of the facility. Training and education of the ISO 14001 standard took quite a bit of time. This time spent could have been minimized had Lowell hired a consultant to aggressively train all the members of the facility early in implementation. Consequently, Lowell hired a consultant a year and half into the project to assist with documentation and found the outside assistance very useful.
2. If Lowell were to do it over again, the City would have included an additional facility within its fenceline. Currently, the city is examining the possibility of developing an EMS for another City Department. The two-year EMS initiative was a long and involved process, including another facility in the training and education phase would have eliminated duplicating our efforts down the road.
3. Lowell had difficulty with some specific elements of EMS implementation - specifically, the development of metrics. The whole metrics discussion threw the team off track and was very difficult to put together. Lowell lacked documentation regarding the quantification of municipal production numbers, which hindered their ability to develop a baseline analysis of past performance. This practice is still relatively new in the municipal sector; development of the EMS helps facilitate this process.

NEXT STEPS

The Lowell Regional Wastewater Utility will continue their EMS excellence, maintaining third-party ISO 14001 certification for the foreseeable future. For now, the organization has decided that it would be too resource intensive at the present time, due to two major construction projects and a limited workforce, to expand the EMS fenceline. The utility has considered applying for the

U.S. EPA Performance Track program, as means to gain added recognition and internal incentive.

In the coming months, the City will focus more efforts upon external outreach, including a complete overhaul of the utility's website to focus upon EMS and other accomplishments. In addition, the City would like to add information related to the overall workings of a wastewater utility to further build awareness within the local community. The utility is also considering a public newsletter highlighting initiatives and performance.

ADDITIONAL INFORMATION

For additional information on Lowell's EMS experience and progress, please contact:

Mark Young, *Executive Director*
Lowell Regional Wastewater Utility
451 First Street Boulevard, Route 110
Lowell, MA 01850
(978) 970-4248
myoung@ci.lowell.ma.us

ADDITIONAL EMS INFORMATION AND RESOURCES

The amount of EMS guidance material available has grown exponentially over the last few years. A key source of EMS information specifically focused on public entities, such as drinking water and wastewater facilities, is provided by the National Public Entity EMS Resource Center (PEER Center). The PEER Center (www.peercenter.net) is a central clearinghouse of key resources such as service providers, sample documentation, state EMS programs, mentors, training materials, and case studies. The PEER Center is made possible through a cooperative agreement with the U.S. EPA EMS Programs (www.epa.gov/ems).



There are also several alternative EMS implementation guidance manuals available:

Environmental Management System Wastewater Handbook

The U.S. Environmental Protection Agency, the Global Environment & Technology Foundation (GETF), and a Wastewater Steering Committee comprised of wastewater facility managers with expertise and “hands on” experience in developing and maintaining EMSs have completed a joint effort to produce a user-friendly, practical EMS handbook (guidebook) directly focused on the EMS implementation by public wastewater utilities. The Handbook provides practical, step-by-step guidance on EMS implementation.

<http://www.peercenter.net/sector/wastewater/index.cfm?FrontID=3903>

Continual Improvement in Utility Management: A Framework for Integration

This Guide responds to a defined need within utility management by providing a roadmap showing how a collective group of management initiatives interrelate and how a utility can best approach integrating them in the context of a continual improvement management system framework. This Guide was funded through a cooperative agreement with the U.S. Environmental Protection Agency (EPA), and sponsored by the Association of Metropolitan Sewerage Agencies (AMSA) and the Water Environment Federation (WEF).

<http://www.peercenter.net/ewebeditpro/items/O73F3799.pdf>

Third EMS Initiative for Public Entities (2003-2004) – Final Report

This Final Report details the experiences of nine public organizations, including two wastewater treatment facilities, which participated in a U.S. EPA supported two-year EMS initiative. The report describes the implementation strategy, benefits, resources, and lessons learned, including individual organization profiles.

<http://www.peercenter.net/ewebeditpro/items/O73F6926.pdf>

An Environmental Management System Troubleshooters' Guide for Local Governments

The Environmental Management System (EMS) Troubleshooters' Guide for Local Governments has been compiled from experiences and lessons learned through

various EMS Initiatives for Government Entities. The practical data and case study material has been extracted from over 23 municipal, state, and local organizations which implemented EMSs as participants in these initiatives. The document is structured to systematically lead a facility, by addressing the needs and issues that a facility might encounter, throughout the four phases of EMS implementation.

<http://www.peercenter.net/troubleshooters.cfm>

Environmental Management Systems: An Implementation Guide for Small and Medium Sized Organizations

In December 2000, the U.S. EPA, in cooperation with NSF International, completed this revised version of the original guide intended to offer a plain English, common sense guide to organizations interested in implementing an EMS, using the basic Plan-Do-Check-Act model. <http://www.epa.gov/OW-OWM.html/iso14001/wm046200.htm>

PEER LOCAL RESOURCE CENTERS

As part of the PEER Center, eleven Local Resource Centers (LRCs), located throughout the country, have been designated to further advance the goal of public sector EMS implementation. The LRCs, integrated into existing institutions, have been established for the purpose of providing local communities with technical expertise, field tested tools, information sharing, and support for EMS implementation. GETF will provide assistance to these organizations by helping develop business plans, providing relevant EMS materials to facilitate each organization's existing EMS assistance activities, train-the-trainer work sessions on ways to address the needs of public agencies, and other marketing services. These Centers will promote local EMS competence and encourage government-to-government sharing and mentoring that will contribute to significant savings in both time and cost for public sector organizations that want to pursue EMS implementation.



The LRCs were selected in two phases upon the completion of a competitive application and interview processes. The criteria utilized in the selection of the LRC's focused on business experience, EMS expertise, capacity, and organizational commitment, especially top management support. Based on these criteria, the following LRCs were selected:

Georgia Tech Economic Development Institute

Economic Development Building - Technology Square
760 Spring Street NW
Atlanta, GA 30332-0640
Contact: Deann Desai
Phone: (770) 605-4474
deann.desai@edi.gatech.edu
www.edi.gatech.edu/environment

Kansas State University

Pollution Prevention Institute

13480 S. Arapaho Drive
Olathe, KS 66062-1553
Contact: Steve Travis
Phone: (913) 764-6300, ext. 101
steve.travis@jocogov.org
www.sbeap.org

Purdue University

Indiana Center for Clean Manufacturing Technology and Safe Materials (CMTI)
2655 Yeager Road, Suite 103
West Lafayette, IN 47906
Phone: (765) 463-4749
www.ecn.purdue.edu/CMTI

Sustainable Earth Initiative

1904 Franklin Street, Suite 418
Oakland, CA 94612
Contact: Gary Lucks or Sue Sakaki
Phone: (510) 268-9210
gary@sustainableearthinitiative.org or sue@sustainableearthinitiative.org
www.sustainableearthinitiative.org

Texas Commission on Environmental Quality

12100 Park 35 Circle
Austin, TX 78753
Phone: (512) 239-1000
www.abouttexasems.org

University of Colorado

Colorado Environmental Business Alliance
420 UCB
Boulder, CO 80009-0420
Contact: Bud McGrath
Phone: (303)492-3307
bud.mcgrath@colorado.edu
<http://www.ceba.org>

University of Florida

The Center for Training, Research and Education for Environmental Occupations (TREEO)
3900 SW 63rd Blvd.
Gainesville, FL 32608
Phone: (352) 392-9570
Fax: (352) 392-6910
www.treeo.ufl.edu/ems

University of Massachusetts-Lowell

One University Avenue

Lowell, MA 01854
Phone: (978) 934-3900
www.uml.edu/ems

University of Missouri

Institute for Environmental Excellence
121 Fulton Hall, 1870 Miner Circle
Rolla, MO 65401
Contact: Dr. Harvest L. Collier or Amy Gillman
Phone: (573) 341-4390
hcollier@umr.edu or gillman@umr.edu
<http://campus.umr.edu/iee/>

Virginia Polytechnic Institute & State University

Center for Organizational and Technological Advancement (COTA)
110 Shenandoah Avenue
Roanoke, VA 24016
Phone: 540-985-5900
Fax: 540-853-8290
www.cota.vt.edu/vtems/

The Zero Waste Alliance

One World Trade Center
121 SW Salmon Street, Suite 210
Portland, OR 97204
Phone: (503) 279-9383
Fax: (503) 279-9381
www.zerowaste.org



www.peercenter.net



www.getf.org



www.epa.gov/ems

Contacts:

Jim Horne, National Program Manager
U.S. Environmental Protection Agency
1200 Pennsylvania Ave. NW
Washington, DC 20460
(202) 564-0571
horne.james@epa.gov

Faith Leavitt, Principal
Global Environment & Technology Foundation
14620 Fair Havens Road
Fort Myers, FL 33908
(239) 281-0052
fleavitt@earthvision.net

Nick Martin, Program Manager
Global Environment & Technology Foundation
2900 South Quincy Street, Suite 410
Arlington, VA 22206
(703) 379-2713
nmartin@getf.org